RELATIVE EFFECTIVENESS OF SWADDLE BATH AND CONVENTIONAL BATH ON LEVEL OF THERMAL STABILITY AND CRYING DURATION AMONG PRETERM INFANTS AT SELECTED HOSPITAL, SURAT, 2015.

DISSERTATION SUBMITTED TO

THE TAMIL NADU DR.M.G.R.MEDICAL UNIVERSITY

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IN PARTIAL FULFILMENT OF REQUIREMENT FOR THE DEGREE OF

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LIST OF ABBREVIATIONS

ANOVA	-	Analysis of Variances
APGAR	-	Appearance, Pulse, Grimace, Activity, Respiration
AWHONN	-	Association of Women Health, Obstetric for Neonatal Nurses
C	-	Celsius
CNE	-	Continuing Nursing Education
CINHAL	-	Cumulative Index to Nursing & Allied Health
D.F	-	Degrees of Freedom
F	-	Fahrenheit
ICCR	-	International Centre for Collaborative Research
IFPB	-	Indian Foundation for Premature Babies
MEDLINE	-	Medical literature Analysis and Retrieval System Online
MDG's	-	Millennium Developmental Goals
MMNE	-	Moran Neonatal Neuro-behavioural Exam
NGO	-	Non Governmental Organization
NICU	-	Neonatal Intensive Care Unit
NTE	-	Neutral Thermal Environment
RSRM	-	Raja Sir Ramaswamy Mudaliar Hospital
SD	-	Standard Deviation
SIDS	-	Sudden Infant Death Syndrome
U.S.A	-	United States of America
WHO	-	World Health Organization
WPD	-	World Premature Day

LIST OF SYMBOLS

χ^2	-	Chi square
=	-	Equals to
<	-	Less than
>	-	More than
%	-	Percentage
+/-	-	Plus or Minus
×	-	Multiplication
^{0}	-	Degrees
F	-	ANOVA
p	-	Level of significance
n	-	Number of samples
N	-	Total number of samples

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

Relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants at selected hospital, Surat.

Abstract:

Aim and Objective: To assess the relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants. **Methodology:** Quantitative approach, True experimental comparative research design was adopted to compare the relative outcome of swaddle bath and conventional bath on level of thermal stability and crying duration among 60 preterm infants (30 in group A and 30 in group B) who satisfied the inclusion and exclusion criteria in Neonatal Intensive Care Unit (NICU) at Anand Hospital, Surat. Simple random sampling technique – lottery method was used to select the samples. The swaddle bath was given to group A and conventional bath was given to group B. **Results:** The study findings revealed that there was no significant difference in the pretest level of thermal stability among preterm infants between group A and group B. The calculated unpaired 't' value of thermal stability at 10^{th} minute & at 30^{th} minute after bath were 2.27,4.33 for temperature; -7.39,-6.80 for heart rate; -10.75,-7.21 for respiratory rate; 2.40,1.39 for oxygen saturation respectively which shows that there was high statistical significant difference between group A and group B at $p<0.001$ level. The crying duration among preterm infants between group A and group B revealed that swaddle bathed preterm infants cried less period than conventionally bathed preterm infants. The calculated unpaired 't' value was -10.92 which shows there was high statistical significance at $p<0.001$. **Conclusion:** The results revealed that the swaddle bath was found to be relatively effective in maintaining thermal stability for prolonged period of time and reducing crying duration, where as conventional bath could not maintain thermal stability and thus swaddle bath can be practiced as a part of routine nursing care for stable preterm infants during hospitalization

Keywords: *swaddle bath, conventional bath, thermal stability, crying duration, preterm infants*

INTRODUCTION

Preterm infants are considered to be "Born too soon" or "Preemies", in which they are both structurally and physiologically immature presenting very small and scrawny appearance because they have only minimal subcutaneous fat deposits and they are more vulnerable pertaining to their physical immaturity. The adaptation of a preterm infant to the extra uterine life can take weeks or even months to complete, leading to short term and long term difficulties for survival.

The central nervous system is a critical organ system that is structurally and functionally immature in preterm infants where hypothalamus is still immature in

function commonly causing thermal instability and due to lower level activities of vagal nerve, which extends from the brain stem to the abdomen causes tension in the vocal cords and there by affects crying patterns. The detrimental effects of this structural immaturity causes behavioural distress cues in preterm infants like crying and fussing during the daily nursing practices like painful heel stick procedures, diaper changing, feeding, position changing and finally bathing.

Bath is an essential nursing procedure during hospitalization in NICU as it protects from microbial colonization and therefore prevents nosocomial infection, preserves skin integrity, minimizes Trans-epidermal water loss and rehydrates skin, promotes hygiene, improves feeding practices and thus creates an environment for holistic growth of life. There are various kinds of bath with their own benefits such as lap bath, tub bath, sponge bath, oil bath, easy bath and swaddle bath for preterm and term infants.

Swaddle bath is one of the stress free, safe and secure bath simulating the familiar uterine environment for preterm infants but the current practice of conventional bath for preterm infants followed in various hospitals is “easy bath”, which is a simplest and time saving for nurses. The investigator during her clinical experience identified that preterm infant exhibit various physiological and behavioural stress cues during bath. Therefore the investigator felt to compare the relative outcome of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants.

Objectives

1. To assess the relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants.
2. To correlate the post test mean score of thermal stability with post test mean score of crying duration among preterm infants in group A and group B.
3. To associate the selected demographic variables with the mean score of thermal stability and mean score of crying duration among preterm infants in group A and group B.

Null hypotheses

NH_1 - There is no significant difference in relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants at $p<0.05$ level.

NH_2 - There is no significant correlation of post test mean score of thermal stability with post test mean score of crying duration among preterm infants in group A and group B at $p< 0.05$ level.

NH_3 - There is no significant association with selected demographic variables with the mean score of thermal stability and mean score of crying duration among preterm infants in Group A and Group B at $p<0.05$ level.

METHODOLOGY

A true experimental comparative research design was adopted in order to compare the relative outcome of swaddle bath and conventional bath on level of thermal stability and crying duration. The independent variables of this study were swaddle bath for group A and conventional bath for group B. The dependent variables were thermal stability and crying duration. The study was conducted in Anand Hospital, Surat. The study population includes preterm infants between 30-36weeks of gestation admitted in Anand Hospital. The sample size consisted of 60 preterm infants (who fulfills the inclusion and exclusion criteria) selected by simple random sampling technique – lottery method, pair matching was done for selected demographic variables such as gestational age , gender and place of preterm infant before bath and homogeneity of the groups were maintained. The study included the preterm infants with stable physiological parameters and after the cord fall. The study excluded parents of preterm infants who were not enrolled to participate in this study.

The tool consisted of two parts i.e., data collection tool and intervention tool. The data collection tool used in this study was structured interview schedule and medical record review for demographic data, WHO guidelines was used to assess the level of thermal stability and Video recording was done during bath to assess the crying duration using crying percentage formula. After preparation of articles, environment and preterm infant, the investigator wore cap and mask and performed hand hygiene and given swaddle bath once to the preterm infants for the duration of 5minutes, in which the preterm infant was snuggly wrapped with autoclaved thick soft towel in a flexed midline

position and placed in the tub filled with warm water till shoulder level with the temperature of 100-101° Fahrenheit. Then each part of the body is individually unwrapped, washed with mild foamless soap, rinsed from lower and upper limbs, trunk to head and rewrapped in group A. The investigator given conventional bath once to the preterm infants by exposing the body and wiped with wet wipes from face to neck, trunk, limbs, genitals and back, for the duration of 5minutes in group B. After the both swaddle and conventional bath the preterm infant was wiped with dry cloth, mummified and given to mother for feeding. The whole procedure was videotaped by research assistant and the videos were used to interpret crying duration and calculated crying percentage.

RESULTS AND DISCUSSION

The findings of the study revealed that when comparing the thermal stability among preterm infants between group A and group B, there was no significant difference in the pretest level of thermal stability among preterm infants between group A and group B. The post test mean difference & calculated unpaired 't' value found at 10^{th} minute & 30^{th} minute after bath were 0.86, 0.90 & 2.27, 4.33 for temperature; -36.23,-33.46 & -7.39, -6.80 for heart rate; -19.40,-15.00 & -10.75,-7.21 for respiratory rate ; 0.83,0.53 &2.40,1.39 for oxygen saturation respectively. The calculated unpaired 't' value shows there was statistically high significant difference in the post test level of thermal stability among preterm infants between group A and group B at $p<0.001$ level.

The comparison of crying duration among preterm infants between group A and group B revealed with the mean percentage and calculated unpaired 't' value which shows that swaddle bathed preterm infants cried less with 23% and conventionally bathed preterm infants cried for longer time of 52.67%.The calculated unpaired 't' value was -10.92 which shows there was high statistical significant difference between group A and group B at $p<0.001$ level.

Thus the null hypothesis NH_1 stated earlier that **"There is no significant difference in relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants at P< 0.05 level was rejected."**

The analysis of correlation coefficient between post test mean score of thermal stability(temperature, heart rate, respiratory rate and oxygen saturation) and post test mean score of crying duration in group A using Karl Pearson correlation revealed that 'r' value of -0.35,- 0.69; 0.44,-0.21; 0.15,-0.19 and 0.24,-0.08 at 10^{th} and 30^{th} minute after the bath respectively showed a negative correlation which was significant at $p<0.05$ level whereas in group B, the Karl Pearson Correlation revealed that 'r' value of -0.17,- 0.40; 0.10,-0.04; -0.12,-0.13 showed a negative correlation and 0.02,0.06 showed a positive correlation at 10^{th} and 30^{th} minute after the bath respectively which was significant at $p<0.01$ level.

Thus the null hypothesis NH_2 stated earlier that **"There is no significant correlation on post test mean score of thermal stability with post test mean score of crying duration among preterm infants in group A and group B at P< 0.05 level was rejected.**

The study findings were analyzed by means of one way analysis of variance. The One way ANOVA 'F' test was used for association. In group A (Swaddle bath) the calculated F' value indicated there was significant association of mode of delivery, postnatal age, gender, birth weight and type of feed with thermal stability & mode of delivery, post natal age, gender, type of feed, time of last feed with crying duration. In group B (conventional bath) the calculated 'F' value indicated there was significant association of mode of delivery, postnatal age, frequency of feeds with thermal stability & place of preterm infant before bath with crying duration.

Hence the null hypothesis **NH_3** stated earlier "**There is no significant association of selected demographic variables with the mean core of thermal stability and mean score of crying duration among preterm infants in group A and group B at P< 0.05 level" was rejected** for the demographic variables namely mode of delivery, post natal age, gender, birth weight, type of feed for thermal stability and mode of delivery, postnatal age, gender, type of feed and time of last feed before bath for crying duration in group A. Time of last feed, mode of delivery, post natal age and frequency of feeds in a day for thermal stability and place of preterm infant before bath for crying duration in group B. It was **accepted** for other demographic variables for thermal stability and crying duration in both group A and group B.

CONCLUSION

The findings proved that the swaddle bath was relatively effective in maintaining the thermal stability both at 10^{th} minute and 30^{th} minute after bath for prolonged period of time and reduced stress cues during the bath by reducing crying duration. Whereas in the conventional bath thermal stability was not maintained at 10^{th} minute but maintained at 30^{th} minute after bath and could not reduce the distress during the bath i.e., the crying duration. Therefore the swaddle bath was found relatively effective than conventional bath in maintaining thermal stability and reducing crying duration and hence this bathing method, which includes in itself the components of developmental care, offers an appropriate, stress free and safe method for preterm infants and can be used as a routine bathing method in NICU's.

IMPLICATIONS

The nurse can adopt swaddle bath as a safe, secure and comfortable daily nursing practice and can give stress free bathing experience for all stable preterm infants as well as term infants at their clinical areas of practice. The nurse educator can incorporate the major study findings in the nursing curriculum at various levels to develop and well equip the staff nurses in the NICU's in order to identify and improve the immaturity levels of preterm infants. The findings of the study can be disseminated to the nurses working in various institutions and student nurses through media and also can train their mothers as a part of preterm care to maintain thermal stability and reduce crying duration at home settings. The nurse administrator should take initiation in organizing CNE, conferences and workshop on various trends of swaddle bath on thermoregulation or level of thermal stability and crying duration in order to reduce behavioural distress among preterm infants. The nurse researcher can generalize the study results by replicating the study with larger population.

CHAPTER – 1

INTRODUCTION

INTRODUCTION

Preterm infants are infants born before gestational age of 37 completed weeks or 259 days of gestation. Neonates born between 34-36weeks of gestation are known as "Near term" or "Late preterm" infants and between 26-34 weeks of gestation are called as "early preterm" infants, whereas before 26 weeks of gestation are said to be "very preterm" infants. However prematurity is a leading cause of neonatal mortality and morbidity in India. The morbidity associated with preterm birth often results in enormous physical, psychological and economic costs.

The outlook for preterm infant is largely related to the state of physiological and anatomical immaturity of the various organ systems at birth, thus a preterm infant finds difficult to adjust with the extra uterine life because throughout the intra-uterine life the preterm infants fundamental stages of growth and development are done in an ideal environment, offering fortification and security. However, when a neonate is born prematurely this becomes far from the veracity as constant care is provided in the Neonatal Intensive Care Unit (NICU).

Preterm infants are frequently admitted to NICU to receive exceptional care. When extra uterine life begins in NICU, the short or long term outcomes of infant cannot be predicted. These infants are exposed to an assortment of stressors in NICU such as painful procedures, interrupted sleep pattern, extreme noise and light levels, and separation from the mother. These stressors can unfavorably affect physiological and psychological maturation cum organization of vision, hearing, sleeping pattern and accordingly the growth of neuro-development, all of which have been found to cause distress in preterm infants, disrupting their normal growth and development which have impact on their daily life. It is important to protect this vulnerable population as much as possible from the damaging effects of the unfamiliar extra-uterine environment. There are diverse measures like incubator and radiant warmer to protect the preterm infants from temperature loss and to maintain thermal stability since the preterm infant's central nervous system is immature. It is also obligatory to condense the stress levels like crying, fussing, back arching and finger splaying, which are generally experienced by the

preterm infants during daily nursing practices like painful heel stick procedures, feeding, position changing, diaper changing and bathing (Als. H 2010).

Bath is an essential daily nursing practice to preserve skin integrity, to maintain the function of skin, to protect against skin breakdown caused by epidermal stripping and extravasations, to minimize trans epidermal water loss thereby rehydrates skin and promotes stratum corneum barrier maturation in order to prevent microbial colonization, promotes hygiene and improves feeding practices. Thus bath acts as precursor to create an environment for physical, psychological and emotional growth of preterm infants. There are various kinds of bath with their own benefits such as lap bath for bonding with mother, tub bath to prevent heat loss, sponge bath and easy bath to save time for nurses, oil bath for weight gain for preterm infants, and swaddle bath to reduce crying duration. In this regard, the researcher felt to compare the effects of bath in care-giving practices and compared with the current practice of conventional bath known as easy bath to find the relative effectiveness on maintaining thermal stability and reducing behavioral stress cues like crying, in order to enhance developmental outcomes of preterm infants.

1.1 BACKGROUND OF THE STUDY

Preterm infants although ‘born too soon’, are not necessarily ‘ill’. The immature systems and organs of the preterm infant require support to survive outside the womb and to overcome the related problems. These encounter a different set of challenges ranging from birth asphyxia due to lack of oxygen during delivery, congenital abnormalities can include heart, brain, gastrointestinal, limbs and spine, birth trauma. These problems can involve the lungs as they unable to sustain their own respiratory function, immune system where they are susceptible to infections, the liver in which a high percentage of premature infants become jaundiced, gastrointestinal system as they unable to tolerate feeds and have prolonged periods of nothing by mouth, eyes with risk of retinopathy of prematurity, and the brain as immature vessels which are very fragile and are at risk from intra ventricular hemorrhage and apnoea resulting from an immature central nervous system. One of the main problems facing sick term and preterm infants is thermoregulation or the need to keep the body warm (Smith & Jacqueline, 2012).

Today marks the 4th global effort to focus everyone's attention on global problem of preterm birth and its prevention, which involves over 200 countries, Non Governmental Organizations (NGO) and relevant organizations. WPD (World Premature Day) is celebrated on 17th November each year to raise awareness of preterm birth and their families worldwide. It summarizes the latest evidence on prematurity and the interventions most needed to prevent it and care for preterm babies. (Born too soon: The global Action Report on Preterm Birth, 2015).

Global scenario shows that 15 million babies are born premature every year, accounting for about one in 10 of all babies born worldwide and 1.1 million babies die annually from complications of prematurity. Globally, prematurity is the leading cause of newborn deaths and the second leading cause of death after pneumonia in children under the age of five (WHO fact sheet Nov 2013). The global distribution of prematurity is uneven where 5-18% is the range of preterm birth rates across 184 countries of the world and >80% of preterm births occur between 32-37weeks of gestation and most of these babies can survive with essential newborn care. Majority of 75% of deaths of preterm births can be prevented without intensive care and 7 countries have halved their numbers of deaths due to preterm birth in the last 10 years (Blencowe, Cousens, Ostergaard, Chou, Moller, Narwal, WPD Report, 2015)

Indian Foundation for Premature Babies(IFPB),2015 report raises concerns about the financial burden on families to save a preterm infant, the maximum burden is seen when the baby is 28-36weeks. In high income settings, half of the babies born at 24weeks are likely to survive, but in low income settings half of the babies born even at 32weeks die due to lack of basic care.

Table no.1.1.1 Survival ability of preterm infants

Levels of Income	Preterm infants born with Gestational age	Survival ability of preterm infant
High income	Born with 24weeks	Likely to survive
Middle income	Born with 28weeks	Moderately survive
Low income	Born with 32weeks	Mostly Die

Source : Indian Foundation for Premature Babies IFPB,2015

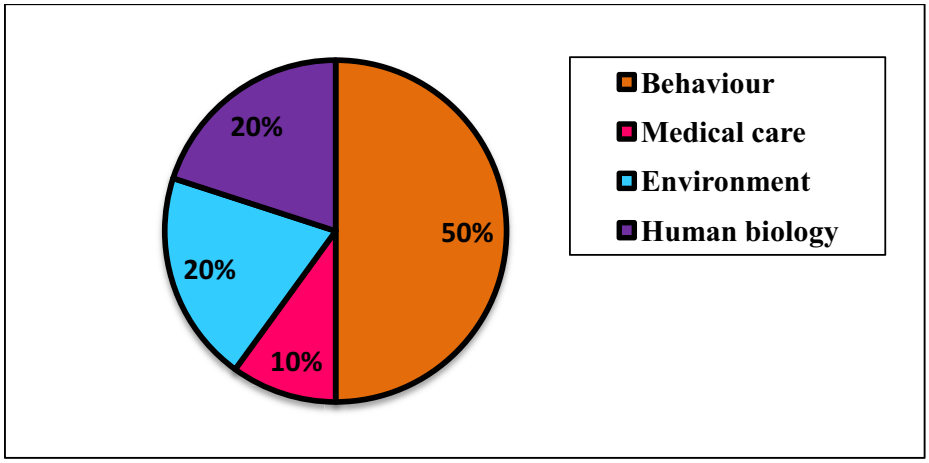


Figure 1.1.1: Major Determinants of premature mortality, WHO (2012).

Preterm infants mortality is increasing day by day due to various determinants like 50% of mortality is due to behaviour determinants like distress, 10% of medical care, 20% of environment and 10% of Human biology (the anatomy and physiological immaturities of preterm infant).

According to a data elicited in a newspaper, India shares highest preterm birth burden. Nearly 24% or one in 4 children born prematurely across globe in 2014 were from India and recorded data tells that highest number of births of preemies are born before time i.e. 45.25 lakhs (Times Of India : Report New Delhi 20 June , 2014).

India tops the list of 10 nations contributing to 60% of the world's premature deliveries. India has been striving to achieve Millennium Development Goal 4 to reduce the under 5 years of age child mortality, burden of premature birth which requires both focused attention and evidence based intervention (WHO Fact Sheet 2013).

Every third child born in India is premature, said by neonatologists of Mumbai and Gujarat. About 25% of all preterm deaths in the world occur in India. It is estimated that 3.6 million premature births took place in India in 2010 (National Neonatal Forum, 2015).The paradigm of premature deliveries in India is changing and has become a disease of the marginalized as well at the affluent. Around 300,000 preterm infants annually die due to complications in India (Lasta Bhatt, Indian foundation of Premature Babies).

Institute of Child Health, Chennai receives about 10-20 newborns daily, of which 5-6 were preterm infants. Out of 100 preterm infants, 85% face no problem, 10% would need special care and 5% need intensive care (Head of Neonatology, Institute of Child Health and Hospital for Children, Chennai, 2010).

The Ministry of health and family welfare is working towards a multi-prolonged strategy to prevent preterm births. Three-quarters of premature infants could be saved with current, cost effective interventions during the daily nursing practices like painful heel stick procedures, diaper changing, position changing and bathing because during these practices neonates face lot of challenges in order to comfort themselves (Nikita Mehta, 2015).

Every single neonate born premature is at risk for grave health problems. Even the babies born merely four to six weeks early (30-36weeks) can have diverse effects from the preterm birth such as hypothermia, breathing difficulties, feeding problems, jaundice and in addition effects the brain functions (Global preterm birth fact sheet,2015). One of the main problems among preterm infants is thermoregulation or the necessity to keep their body warm. The preterm infants are prone to temperature instability which needs to be highly acknowledged and understood in order to suitably manage the situation and limit the effects of either cold or heat stress (Smith, Alcock and Usher, 2013). It is vital that preterm infants are given utmost care within their 'Neutral Thermal Environment' (NTE) which is defined as "the environmental air temperature at which an infant with a normal body temperature has a least metabolic rate and therefore negligible oxygen consumption" (Waldron and Mackinnon, 2010). The upholding of the NTE is the ultimate aim of preterm infants temperature control and management.

The preterm infant challenged by cold stress undergoes a number of physiological changes which may be life threatening. The changes consist of Peripheral vasoconstriction resulting in maximal tissue insulation, an obligatory rise in metabolic rate and sympathetic response in which nor epinephrine release will increase the metabolic rate leading to increased oxygen consumption, metabolic acidosis, which is the result of two functions. Firstly, increased metabolic rate and secondly, persistent vasoconstriction, causing a reduction in tissue perfusion and oxygenation and pulmonary vasoconstriction which decreases pulmonary perfusion (Palyzyan P, Kazemian N, Zaeri F. Hayat 2010).

Comprehensive periods of cold stress can lead to detrimental side effects which comprise hypoglycemia, hypoxia, metabolic acidosis, respiratory distress, necrotizing enterocolitis and at last failure to gain weight (Mc Call et al, 2010). Factors that augment the risk of hypothermia embrace prematurity, intrauterine growth retardation, birth asphyxia along with congenital anomalies like gastroschisis and lastly damages the central nervous system (Waldron and MacKinnon, 2010).

The preterm infant has high 'trans-epidermal' water losses due to a thin, poorly keratinised skin (stratum corneum) which universally matures by 21 days of postnatal age. Trans-epidermal water loss is a most important cause of heat loss in the preterm infant.

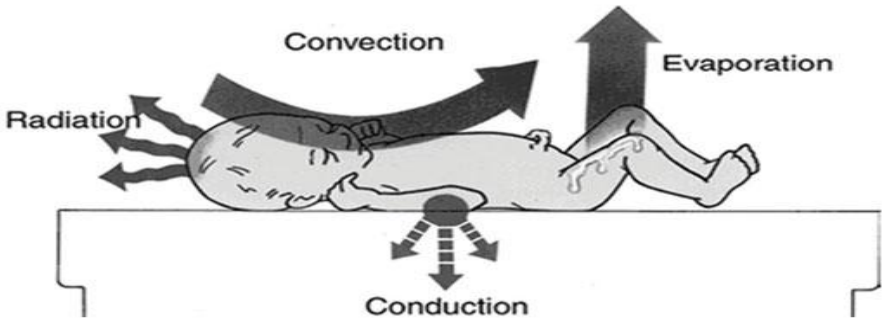


Fig 1.1.2: Mechanism of heat loss, Journal of Perinatal and Neonatal Nursing, 2010

Heat loss can be physical or physiological. Physical heat loss can occur in four different ways such as radiation, convection, conduction and evaporation. Radiation is the transfer of heat energy from one surface to another in the form of electromagnetic waves. Convection is a process by which the air temperature can deliver or take heat away from the body. Conduction is the transfer of heat directly from molecule to molecule. Evaporation is a change of state from a liquid to a gas or vapour.

The term and preterm infant may be incapable of thermoregulation, this presents a challenge to the nurse who is charged with the responsibility of ensuring the neonate’s temperature is maintained within a range conducive with life. To enable the neonatal nurse to comprehend the complexities of thermoregulation in the neonate the nurse must be able to understand the anatomy and physiology of the neonate and the complexities that hyperthermia and hypothermia can cause in the preterm and term infant.

The process of maintaining a constant body temperature for these neonates involves many processes and procedures. For example, it is essential for the nurse or other health care team members to ensure the neonate is kept at a constant and suitable environmental temperature, the neonate's core body temperature is measured accurately and regularly, and that illnesses or factors that have the potential to impact on temperature regulation are managed. If the skin becomes moisture it becomes a breeding soil for bacteria and fungus which affects the underdeveloped skin integrity among preterm infants. So therefore daily or alternatively bath is necessary to prevent microbial growth.

The importance of temperature monitoring must be stressed, both in and out of the NICU. Recognizing methods of heat loss and knowing ways to prevent it, can improve the morbidity and mortality of these infants. They are different from adults and this fact must be appreciated. Emphasis must be placed on minimizing total heat loss, using the various methods or practices in daily routines like bathing (Mary Ellen Farney, Carna, Ba Frank L. Seleny, MD 2011).

Routine bath is an essential nursing procedure in order to remove contaminants, waste material, Creams and emollients from the skin and reduces microbial colonization. Bath also sloughs dead skin cells, rehydrates skin surface, supports physical growth, psychological growth, emotional growth, provides developmentally appropriate experiences, promotes parent-infant bonding and interaction, minimizes potential complications and poor outcomes.

There are various bathing methods such as tub bath, sponge bath, lap bath, oil bath, easy bath and swaddle bath. Filho LC (2012) recommends Swaddle bath for term and preterm infants as it mimics the uterine environment by placing preterm infant in flexed midline position and immersing in warm water which simulates familiar feeling to preterm infant as being in amniotic fluid. Tub bathing or sponge bathing is a stressful experience for healthy newborns and is even more nerve-racking for vulnerable preterm infants with inappropriate physiological stability. Sponge bath or easy bath for preterm infants poses significant temperature loss and has been shown to be hectic experience because of adverse physiological responses like tachycardia, oxygen de saturation and

adverse behavioral responses like crying, startle responses and agitation among preterm infants (Association of Women's Health, Obstetric, and Neonatal Nurses, 2013).

The investigator during her clinical experience identified the physiological responses like hypothermia or hyperthermia, tachycardia or bradycardia, tachypnoea or bradypnoea, oxygen desaturation and behavioural responses like crying, fussing, back arching and trunkal flaccidity of the preterm infants to various types of bath. Such responses were not given much clinical importance due to negligence of nurses in a very busy NICU. Hence the investigator had felt the need of simple, safe, secure, stress free bath and also time saving nursing practice to maintain thermal stability and reduce crying duration.

1.2 SIGNIFICANCE AND NEED FOR THE STUDY

Today's children being citizens for tomorrow's world need to be cherished, loved, and reared in a healthy atmosphere. Preterm infants are open to the elements of different stressors in NICU such as painful procedures, interrupted sleep, unnecessary noise and light levels, and separation from the mother. Although the first bath is essential to prevent cross contamination of body fluids between the preterm infant and the health care provider, it can be a significant factor influencing successful extra uterine transition and parental bonding during the early neonatal period.

The brain is the very last major organ to mature in neonates. The immature brain continues to develop and grow even after the time of birth. The more prematurely the neonate is born, the more likely bleeding or other signs of behavioural stress affects the innermost brain. When 35weeks of prematurity is concerned, the preterm infants brain weighs only two-thirds and if the neonate is born untimely, even just few weeks, this important brain growth takes place in an unusual extra uterine environment (outside the womb). Preterm infants endure lifelong effects such as cerebral palsy, mental retardation, behavioural cum emotional troubles and furthermore learning difficulties. Preterm infants are more likely to require early interventions in order to prolong their life (short term and long term effects of preterm birth fact sheet, 2015).

Preterm infants are incapable of thermoregulation, this presents a challenge to the health care professionals to ensure the temperature is maintained within normal ranges (Nadel 2010). Control of body temperature is achieved by a complex system via negative feedback, which includes an important balance between heat loss and heat gain.

The hypothalamus is a temperature regulating centre called as 'set point' is responsive to the temperature of circulating blood. This centre controls body temperature through autonomic nervous system. The effectors are thermogenesis and vasomotor system, where vasomotor centre is medulla oblongata controls the diameter of small arteries and arterioles. The vasomotor centre is influenced by the temperature of its blood supply and by nerve impulses from the hypothalamus. The controlled detectors are body temperature and cutaneous thermoreceptors.

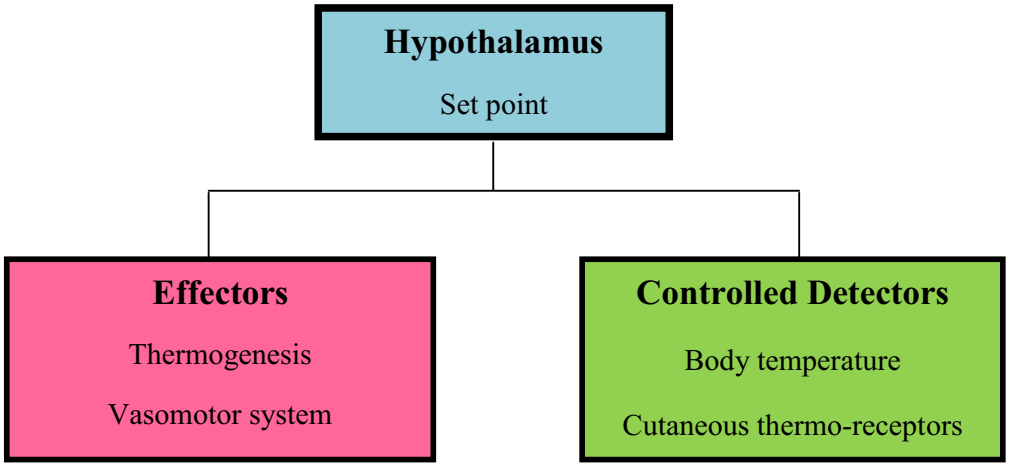


Fig.1.2.1: Schematic representation of the thermoregulatory system (Okken, 1995)

A study contributes that subsequent period to the preterm infant's bath is the risk of temperature loss due to large body surface area compared to body mass, insufficient brown fat for non-shivering thermo genesis, thinner skin, and less ability to maintain flexion of extremities. Thus these are the factors making preterm infants more likely to experience heat loss and hypothermia as compared with the term infant (Loring C, George K, Gargan B, Leblanc V, Lundgren D & Reilly J 2012). Hypothermia or temperature loss leads to a complex variety of problems like tachypnea, apnea, hypoxia, metabolic acidosis, hypoglycemia, coagulation defects, acute renal failure, necrotizing enterocolitis, and finally ultimately death (Palyzyan P, Kazemian N, Zaeri F, 2010).

A volume of evidence found that traditionally, sponge baths were given to newborns until the fall of umbilical cord, later tub baths were introduced. Even though infants born prematurely, they continued to have sponge baths as part of their routine care during their prolonged hospitalization in NICU but then sponge bath posed more of a risk due to heat loss, physiological alterations, including changes in heart rate, oxygen requirements and saturation level, and detrimental behavioural cues, including crying, wimpering and thrashing (Liaw J, Yuh S, Yin T &Yang L 2010).

The Nursing professional practice committee hypothesized that we could improve the preterm infant care by switching from sponge bath to immersion bath in order to prevent heat loss from neonates. Research review revealed that evidence supporting the theory that immersion bathing improved temperature stability ,bonding ,breast feeding and parental education (Nurses commitment to best practice infant care and family bonding on evidence based research : A Journey Of Infant Bathing, 2013).

Filho L.C, 2010 contributes that the womb is a condensed environment with clear boundaries offering sanctuary and security to the infant, which can be mimicked through the containment of swaddling provided during swaddle bath. Immersion of preterm infant in the tub of warm water also stimulates the uterine environment as like immersion of fetus in the amniotic fluid of mother's womb. Therefore combining the immersion into water and the containment may therefore offer a familiar feeling and promotes calm and stress free bathing experience in swaddle bath. Giacoman (2010) found that swaddle bathed preterm infants are likely to have improved sleep patterns after bath.

Swaddle bath is one of the bathing methods that incorporates developmental principles of bath for preterm and term infants thereby reduces behavioural distress cues into daily care giving practice (Quraishy K, Bowles SM, Moore J 2013). Therefore it was assumed that this nursing practice reduced the risk of bacterial colonization and infection, which known to be a life threatening problem for preterm infants (Boxwell,2011). Liaw, Yang,Yuh, Yin, 2012 found that there are observed benefits after swaddle bath to preterm infants as improved physiological state control, conserved energy, conserved structural, personal and social integrity as well as improved parenting skills among parents of preterm infants and decreased parental stress during swaddle bath.

Mitra, Maryam, Sedigheh, Zohre (2014) compared the swaddle bath and conventional bath on body temperature and crying duration and found that swaddle bath has been shown reduced temperature loss and prevented behavioural stress cues which were generally found during conventional bath like sponge or tub bath, known as crying, back arching and extended limbs and splayed fingers. Peters K.L (2012) found that those preterm infants given swaddle bath were recognized in improving the stability of physiological parameters and reducing behavioural stress signs, including crying and fussing, which continue to be of concern with infant tub baths.

Multiple Researchers (Fern D, Graves C, Huillier M 2014) stated benefits of swaddle bath among preterm and term infants comprises reduced physiological and motor stress cues, conservation of energy, improves physiological state control i.e., decreased crying and agitation. Furthermore facilitated social interaction by keeping the newborn in a calm, quiet alert state, increased self-regulatory behaviours and enhanced the preterm infant ability to participate in feeding immediately after the swaddle bath, and thus increases the feeling of warmth and security in the infant. The study also observed wide variety of benefits to parents such as increased confidence in parenting skills, facilitated parent infant attachment, enhanced interaction with the infant and decreased parental stress during bath.

Neu & Brown (2012) compared the swaddle bathed preterm infants versus unswaddle bathed preterm infants during weighing procedures. The possible hazards to preterm infants during weighing procedure were recognized and the obtained data indicated that the beneficial effects were found in swaddle bathed preterm infants. Loring et al. (2012) found infants who were tub bathed had fewer variations in body temperature and were little warmer at 10th and 30th minutes after the swaddle bath. Karl (2011) says that interactive bath helps many parents in better understanding their infant and supports parent-infant attachment.

Swaddling an infant was found to be advanced and more effective in reducing the crying duration in infants compared to infant massage therapy. A research study found that infants in the swaddle group were found to have improved behaviour regulation, improved ability to cope with stress and improved neuro-behavioural organization than the other group (Ohgi, Akiyama, Arisawa & shigemori, 2010).

Considering the diverse problems of preterm infant, one of the most important concerns in bathing preterm infant is maintaining their regular body temperature and reducing behavioral stress cues, like crying and fussing which tends to trunkal flaccidity, hiccoughing, yawning, tremoring, extremities flaccidity, facial flaccidity, arching, finger splaying, grimacing and tongue extension which leads to expenditure of large amounts of energy. These emerging behavioural stress cues are predictable to have an impact on other subsystems of health, most significantly autonomic nervous system (Liaw J et al. (2013).

The investigator during her clinical experience observed that preterm infants were not given bath in few hospitals even they become stable but to reduce the developmental consequences like nosocomial infections caused by daily nursing practices during the hospitalization of preterm infant in NICU. The investigator observed various types of bath such as sponge bath, tub bath, easy bath and swaddle bath which have both pros and cons for preterm infants. Swaddle bath known for reducing crying duration and the conventional bath used in the current scenario is easy bath which is known for time saving to the nurses in their daily practices but both has impact on the physiological and behavioural health of the preterm infant.

Based on the necessities of the preterm infant and there is minimal research into the physiological and behavioural component, the investigator with her personal and professional interest wanted to compare the relative outcome of the two approaches on level of thermal stability and crying duration i.e., swaddle bath, which provides containment during entire bath and conventional bath, which saves time for nurses in their busy schedule of NICU.

1.3 STATEMENT OF THE PROBLEM

A true experimental study to assess the relative effectiveness of swaddle bath (group A) and conventional bath (group B) on level of thermal stability and crying duration among preterm infants at selected hospital, Surat.

1.4 OBJECTIVES

1. To assess and compare the pre and post test level of thermal stability among preterm infants in group A and group B.
2. To assess the post test crying duration among preterm infants in group A and group B.
3. To assess the relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants.
4. To correlate the post test mean score of thermal stability with post test mean score of crying duration among preterm infants in group A and group B.
5. To associate the selected demographic variables with the mean score of thermal stability and post test mean score of crying duration among preterm infants in group A and group B.

1.5 OPERATIONAL DEFINITIONS

1.5.1 Relative effectiveness

Refers to the comparative outcome of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants during their hospital stay, which was assessed by checking physiological parameters 10minutes before bath and at 10^{th} and 30^{th} minute after the bath procedure based on World Health Organization (W.H.O) guidelines and by calculating crying percentage with the formula respectively.

1.5.2 Swaddle bath

Refers to bath given once by the investigator to the preterm infant for 5minutes, in which the preterm infant was snuggly wrapped with autoclaved thick soft towel, maintaining in a flexed midline position and placed in the tub filled with warm water with the temperature of 100-101° fahrenheit and immersed till shoulder level. Then each part of the body is individually unwrapped, washed with mild soap, rinsed from lower and upper limbs, trunk to head and rewrapped.

1.5.3 Conventional bath

Refers to the easy bath given once by the investigator to the preterm infant by exposing the body and wiped with wet wipes from face to neck, trunk, limbs, genitals and back, for the duration of 5minutes.

1.5.4 Thermal stability

Refers to the ability of the preterm infants to maintain the level of temperature, heart rate, respiratory rate and oxygen saturation 10 minutes before the bath and at 10^{th} & 30^{th} minute after the bath procedure by checking physiological parameters according to World Health Organization (W.H.O) guidelines.

1.5.5 Crying duration

Refers to the period of time the preterm infant cried during bath, which was filmed in close-up by research assistant from beginning to the end of the bath using a digital camera and it was calculated by using the following formula**.**

$$\text{Crying percentage} = \frac{\text{Crying duration}}{\text{Total bath time (minutes)}} \times 100$$

1.5.6 Preterm infants

Neonates born between 30-36 weeks of gestation weighing >/=1500gms before bath with stable physiological parameters who were admitted in the Neonatal intensive care unit, at selected hospital.

1.6 ASSUMPTION

Swaddle bath may have an effect on level of thermal stability and crying duration comparatively with conventional bath among preterm infants.

1.7 NULL HYPOTHESES

NH_1 - There is no significant difference in relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants at $p<0.05$ level.

NH_2 - There is no significant correlation of post test mean score of thermal stability with post test mean score of crying duration among preterm infants in group A and group B at $p< 0.05$ level.

NH_3 - There is no significant association with selected demographic variables with the mean score of thermal stability and mean score of crying duration among preterm infants in Group A and Group B at $p<0.05$ level.

1.8 DELIMITATION

The study was delimited to a period of four weeks of data collection.

1.9 CONCEPTUAL FRAMEWORK

A conceptual framework is the abstract and logical structure of meaning that guides the development of the study which enables the investigator to link the findings to nursing's body of knowledge.

The theory of health promotion for preterm infants by Linda Mefford who is a clinical associate professor and have done Ph.D at University of Tennessee College of nursing, Knoxville, U.S.A (United States of America) and she derived her theory from levine's conservation model of nursing which is well suited for the needs of these preterm infants. It proposes that the crisis event of a preterm birth creates environmental challenges for both the infant and the family and survival of both the infant and the family system requires rapid and ongoing engagement with the process of adaptive change to bring the wholeness using principles of conservation.

The present study aimed at evaluating the relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants at selected hospital. The investigator has adopted conceptual framework based on the concepts of Linda Mefford' s Theory of health promotion for preterm infants

The role of neonatal nurse is to support adaptive efforts of both the infant and the family by implementing therapeutic and supportive nursing interventions directed towards optimal development.

Step 1 – Adaptation

"Change is the life process and Adaptation is the method of change"

The theory depicts that both the infant and the family attempt to adapt to environmental challenges presented by a preterm birth, with a twin goals of both a healthy infant and healthy family system. The investigator in this study also identifies various adaptive competencies of preterm infants at birth which she categorizes into the family system characteristics. The family system characteristics included gestational age, mode of delivery, postnatal age, APGAR (Appearance, Pulse, Grimace, Activity,

Respiration) score at 5th minute, gender, birth weight, weight before bath, type of feeding, frequency of feeds in a day, time of last feed before bath, place of preterm infant before bath.

Step 2 – Conservation

"Conservation is about achieving a balance of energy supply and demand that is within the individual"

Conservation of Energy – This refers to the balance between energy input and output to avoid fatigue. This is the conservation provided through assessment method. The investigator in this study also done assessment of Pre test level of thermal stability 10minutes before bath among preterm infants in group A and group B. The thermal stability includes temperature, heart rate, respiratory rate, oxygen saturation as measured by checking physiological parameters according to W.H.O guidelines.

Conservation of Structural Integrity - This refers to the maintaining or restoring the structure of preterm infant's body by preventing physical breakdown, promoting skin integrity and promoting hygiene and healing. The investigator in this study also promoted conservation of structural integrity by giving swaddle bath to group A and conventional bath to group B.

The investigator given swaddle bath once to the preterm infants for 5 minutes, in which the preterm infant was snuggly wrapped with autoclaved thick soft towel in a flexed midline position and placed in the tub filled with warm water till shoulder level with the temperature of 100-101° fahrenheit. Then each part of the body is individually unwrapped, washed with mild soap, rinsed from lower and upper limbs, trunk to head and rewrapped in group A.

The investigator given conventional bath once to the preterm infant by exposing the body and wiped with wet wipes from face to neck, trunk, limbs, genitals and back, for the duration of 5minutes in group B.

Conservation of Personal Integrity – This refers to the promotion of health by assessing client and checking whether needs were met, enhanced positive self esteem and self satisfaction. The investigator in this study also had done assessment of post test level of thermal stability at 10^{th} minute & 30^{th} minute after bath using WHO guidelines and assessment of post test crying duration by using formula.

Conservation of Social Integrity – This refers to the helping an individual (Preterm infant) to conserve his or her position in a family, community, and society, promotes bonding to foster social interaction with parents. The investigator in this study also promoted social integrity by giving preterm infant to mother for feeding after bath to promote bonding with mother.

STEP 3 – WHOLENESS

"Wholeness is heath, health is integrity"

It refers to the sound, organic, progressive outcome. It is the adaptation to the environment after interaction. It permits the assurance of integrity. It is the collection of evidence that shows if the patients need has met and that his functional ability has been restored as a direct result of the nurse's interaction. This approach thereby enables the investigator to make suitable decision and recommended action to continue, drop or modify the nursing interaction.

In this study the nurse investigator related wholeness with outcome as it was maintained by using principles of conservation. There are both positive outcome and negative outcome. Positive, which means preterm infants maintained thermal stability & reduced crying duration and negative outcome where the preterm infants not maintained thermal stability & no reduction in crying duration.

- **Reinforcement –** If there was maintained level of thermal stability after swaddle bath or Conventional bath and found with reduced crying duration during the bath, the investigator recommended for reinforcement of the intervention.
- **Enhancement -** If there was no maintenance of level of thermal stability after swaddle bath or conventional bath and found with reduced crying duration during the bath, the investigator promoted enhancement.

Thus, the theory of Mefford's health promotion for preterm infants which was derived from levines conservation model provided to be perfect guidance for the logical framework development of the study which empowered the investigator to design the outline for this study by giving related phenomena and concepts for preterm infants. It also helped the investigator to correlate various components of the theory into different aspects of nursing practice throughout the study; thus enabling to identify relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants.

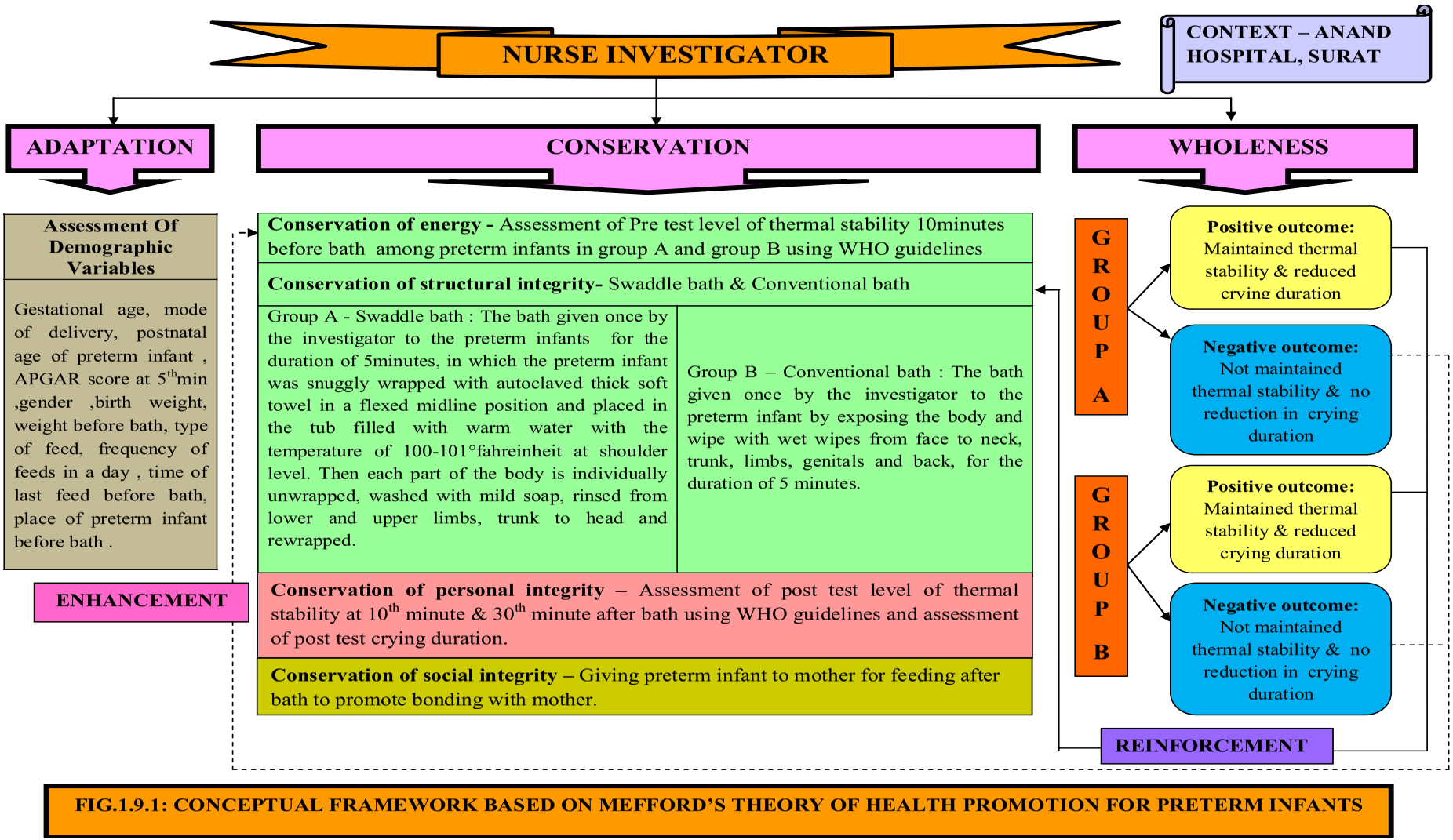


FIG.1.9.1: CONCEPTUAL FRAMEWORK BASED ON MEFFORD'S THEORY OF HEALTH PROMOTION FOR PRETERM INFANTS

1.10 OUTLINE OF THE REPORT

CHAPTER 1: Describes the background of the study, need for the study, and statement of the problem, objectives, operational definition, null hypotheses, assumption, delimitation, and conceptual framework.

CHAPTER 2: Focuses on review of literature related to present study

CHAPTER 3: Explains the methodology of the study

CHAPTER 4: Presents the data analysis and data interpretation

CHAPTER 5: Deals with the discussion of the study

CHAPTER 6: Gives the summary, conclusion, implications and limitations of the study.

The study report ends with selected References and Appendices

CHAPTER – 2

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Review of literature is a systematic search of a published work to gain information about a research topic (**Polit and Hungler, 2012**).

The literature review is based on extensive survey of books, journals and international nursing studies. A review of literature relevant to the study was undertaken which helped the investigator to develop insight into the problem and gain information on that has been done in the past. An extensive review of literature as done by the investigator to lay a broad foundation for the study and conceptual framework framed based on Linda Mefford's Theory of health promotion for preterm infants to proceed with the study under the following headings.

This review of literature was done using the key words such as preterm infants, thermoregulation in preterm infants, body temperature, behavioural stress cues, crying duration in preterm infants, infant containment, swaddle bath, conventional bath. These reviews were searched based on electronic & standard data bases such as Cochrane library, Cumulative Index to Nursing & Allied Health (CINAHL), Google Scholar, Medical Literature Analysis and Retrieval System Online (MEDLINE), Pub Med and other unpublished studies from dissertations. It includes Randomized Controlled Trials, systemic reviews and experimental studies. The reviews were taken from the year 2010 to 2015 to reflect the most current research.

The aim of this review was to examine the literature on bathing techniques among preterm infants and identify relative outcomes associated with different bathing techniques. The intention was to gather the evidence to data and help clinicians achieve better understanding of the topic and subsequently, encourage an improved stress free bathing technique for preterm infants.

For the purpose of logical sequence the chapter is divided into the following sections.

Section 2.1: Scientific reviews related to thermal stability among preterm infants

Section 2.2: Scientific reviews related to crying duration in preterm infants

Section 2.3: Scientific reviews related to swaddle bath

Section 2.4: Scientific reviews related to conventional bath

Section 2.5: Scientific reviews related to physiological parameters of preterm infants

SECTION 2.1: SCIENTIFIC REVIEWS RELATED TO THERMAL STABILITY AMONG PRETERM INFANTS

Thermal stability and its factors

Thermal stability is the ability of the preterm infants to maintain body temperature at normal levels. The infant's thermal environment consists of factors such as ambient air temperature, air flow velocity, relative humidity, temperature and composition of objects in direct contact with the infant. The goal in controlling a neonate's environment is to minimize energy expended by the neonate to maintain a "normal" temperature, thus eliminating thermal stress.

Robin B. Knobel (2013) contributes that thermal stability among preterm infants in NICU is quite difficult to maintain because there are various factors influencing it. Hypothermia continues to be problem for preterm infants being cared for in NICU because nursing care and nursing procedures expose preterm infants to cold environmental temperatures and infants have thermoregulation. Researchers continue to study this problem in order to optimize nursing care with evidence based thermal practices. Promoting optimum thermoregulation with related nursing care must be prioritized in three main areas such as firstly, method of temperature taking, secondly, choice of environment and thirdly, temperature instability and intervention.

James W. Kendig, Ursula Nawab (2012) found that hypothermia is the reduction of core temperature among infants and found that the condition might be environmental basis or represents undercurrent illness. Treatment for it is rewarming and correction of the cause to hypothermia. Multiple Researchers (Lawn J, Consens S, Bhutta Z ,2013) found the influencing factors for thermal equilibrium such as relative humidity, air flow, proximity of cold surfaces and ambient air temperature. Neonates are prone to rapid heat loss because when compared their body, surface area was high than volume of the body. Chiou & Blume et al (2013) found that radiant heat loss occurs when bare body skin is exposed to an outside environment containing items of cooler temperature. Researchers (Knobel RB, Holditch-Davis DD, Schwartz TA, Wimmer JE, 2010) compares

mechanism of heat loss in preterm infants is lack of vasomotor maturity because infants cannot peripherally constrict their blood vessels (have peripheral vasoconstriction) in first phase of cold environment in 12 hours of life. Thermoregulation and prevention of heat loss are to be considered after birth of newborn and in NICU for promoting stabilization of preterm infants.

Lantz B, Ottosson C (2014) found that preterm infant heat loss occurs through its skin and respiratory tract to the environment through radiation, conduction, convection and evaporation. Fat under skin acts as an insulator to prevent heat loss, however, the more the prematurely an infant is born, the less the fat insulation. It is important to understand the mechanisms of heat loss, so that nursing interventions can be aimed to block the transfer of heat from the infant. Karen New, Vicki Flenady, Mark W Davies (2014) contributes that medically stable preterm infants can be transferred to unheated open cots at a lower body weight of 1600gms without adverse effects on temperature stability or weight gain. Higgins (2014) found there were measures to protect these vulnerable preterm infants by dressing, mummification and swaddling. Researchers (Gray & Mc Manus Kuller 2015) conclude that the main factors determining the preterm infants postnatal thermal stability are degree of prematurity, birth weight and postnatal age.

The volume of evidence (Merentstein & Gardner, 2011) contributes the frequency of monitoring temperature as axillary temperature should be checked fourth hourly among infants and must be recorded. If the infants temperature falls beyond the normal range, the medical and authority nursing staff should be informed and readings must be taken more frequently (every 30 to 60 minutes). The nurse must monitor the baby continuously until the temperature found to be normal. If the preterm infant undergoes to any change of external environment or frequently exposed to daily nursing practices such as procedures, phototherapy, new transfer to an incubator or to an open cot, they need periodic monitoring of every thirty and sixty minute temperature checks for the initial few hours until the temperature is found to be stable (Merentstein and Gardner, 2011). Neonates receiving exceptional intensive care, continuous monitoring of peripheral skin temperature is mandatory by use of a probe placing on the sole of the foot (Turnbell and Petty, 2013).

Multiple studies focuses on checking temperature of preterm infants which allows five minutes for skin temperature to stabilise once applied to foot. Peripheral temperature is recorded on hourly basis and the probe site must be changed every four to six hours in a day. The ‘toe-core’ temperature difference is calculated as the difference between the peripheral temperature reading value on the monitor and the central readings done at intervals or on continuous basis. Central monitoring can be done continuously by placing a probe over the abdomen when lying on supine posture, or on the back when lying on prone avoiding bony prominences and excoriated areas. Rectal probes should not be used at any cost. When the difference is found it should be between 1-2°C of temperature variation (Waldron and Mackinnon, 2010).

Humidity plays a vital role in maintaining temperature of infant. The nurse can assist preterm infant by managing fluid and electrolyte imbalance which inturn decreases insensible water loss and maintains skin integrity (Merentstein and Gardner, 2011). The optimum level of humidity is estimated by gestational age, days of postnatal life, maturity of the skin and even underlying pathology.

Bryanton (2014) compares the diverse effects of tub and sponge bath on body temperature among the preterm infants and the results found that the preterm infant's heat loss in less in tub bath method than in sponge bath method at $P<0.001$level. Furthermore in a study Loring (2010) compared premature infants' body temperature before and after tub or sponge bath and reported that the preterm infants in the tub bath group showed significantly less changes in temperature than those in the sponge bath group at $P = 0.02$ level. In a recent study researchers (Palyzyan P, Kazemian N, Zaeri F,2011) found that the preterm infants body heat loss occurs as a result of mechanisms like evaporation, conduction, convection, and radiation processes which concluded that immersing newborns in water almost certainly found effective in reducing temperature loss through evaporation in both tub and swaddle bath methods. Additionally, newborns appear to be more exposed to air flow in the conventional bath method which is commonly used in most of our NICU’s and this dynamic factor probably has a major impact on infant heat loss after the conventional bath. Another study (Quraishy K, Bowles S M, Moore J, 2013) found that in the swaddle bath method, covering the baby and immersing the newborn can reduce heat loss through the mechanisms of radiation, conduction and evaporation.

Lisa Jocheim, Lori Baas, Creighton (2012) found that with growing trend of late preterm infants, it is important for health care providers to recognize their challenges and support a successful transition to extra uterine life as they are cared for in the newborn nursery. Nayeri and Nili (2010) identified hypothermia as a worldwide issue that is associated with an increased risk of morbidity and mortality in infants of all gestational ages. The world health organization (2010) defines normal body temperature for preterm infants as 36.5^0C – 37.5^0C, hypothermia is divided into three categories such as mild, moderate and severe. Loring et al (2012) contributes that by providing supportive care to preterm infants it can reduce thermal and developmental stress during the initial bath.

Association of Women's Health, Obstetric and Neonatal Nurses/National Association of Neonatal Nurses (AWHONN), (2012) evidenced-based clinical practice guidelines for neonatal skin care recommend bath water temperature to be from 100°F to less than 104° F for the newborn infant. Studies that have looked at temperature loss during immersion bathing using an initial bathing temperature between 98.0°F and 100.4°F found that, on average, there was a temperature loss of 0.1°F to 1.1°F after 10 to 30 minutes (George K , Gargan B , Leblanc,2013). One study that started with a water temperature of 100.4°F found significant heat loss experienced by the newborns and that a return to normal thermal ranges took approximately an hour after an immersion bath (Waldron S, Mackinnon R,2013).

The above reviews related to thermal stability in preterm infants conclude that thermoregulation is a core concept with regards to preterm infants, which must be focussed by all the medical and nursing staff in order to prevent hypothermia among preterm infants, even though there are various factors influencing thermal stability, it’s a duty of nurse to promote adaptation to the environment and maintain wholeness of the preterm infant by promoting the conservation principles such as conserving their energy, structural integrity, personal integrity and social integrity in order to maintain thermal stability during the daily practices in and out of NICU especially during nursing practices like changing position, diaper changing, feeding and bathing.

SECTION 2.2: SCIENTIFIC REVIEWS RELATED TO CRYING DURATION AMONG PRETERM INFANTS

Crying duration

Wolf (1969) observed preterm infants for crying and other vocalizations. He described specific characteristics of cries due to hunger, pain, anger and other external stimuli. A rhythmical cry that starts suddenly was most often due to some external stimuli such as sudden noise, a sharp change in illumination and posture, or nakedness. This is the cry most often heard during an infant's bath. The obvious manifestation of distress of the preterm infant is crying. Wasz-Hockert, Lind, Vuorenkosk, Partenen & Volanni (2012) performed an auditory analysis of infants cries, and they found cries are meaningful and will convey information to caretakers if they are interpreted correctly and they concluded that babies communicate needs by characteristic cries as a result of specific nursing practices.

Premature shrill cry may be a sign of something deeper. Preterm infants are more likely to produce piercing cries than their full term peers. Scientists' have studied infant crying as a non invasive way to assess how well a baby's nervous system develops. They found that preterm infants whimper in a shriller voice, but not because they are smaller in size or grew at a slower rate in their mother's wombs. Instead, the researchers suspect the high pitch could reflect lower levels of activities in a preterm infants vagal nerve, which extends from the brain stem to the abdomen. Vagal nerve activities are believed to decrease tension in the vocal cords, thus producing a lower pitch.

Researchers (Riikka Korja, Mira Huhtala, Jonna Maunu & Paiv Rautava, 2014) found that Preterm infant's early crying is associated with child's behavioural problems and parents stress. Rautava P et al. (2012) compared Preterm infant's behavioural, emotional and neurological problems at later ages have been shown to be multi etiologic and explained in part by neurologic and cognitive deficits due to prematurity and psychological factors. Barr RG, Chen S, Hopkins B & Westra T (2012) found that persistent crying problems of preterm infants that last beyond 3 months of age have been related to later hyperactivity and other behavioural problems.

Factors influencing crying duration

Fern et al. (2014) found that crying was less during swaddle bath and high during conventional bathing method. Kreem Awad (2010) found that there is association of crying duration with factors like environmental factors (external noise, temperature, light) and gestational age and behavioural state. Mc Manus Kuller (2014) found that Preterm infants immersed in a tub had showed reduction in crying duration and inducement of a calm and quite state.

Ryuichi Kusaka, Shohei Ohgi & Tetsuya Fujimoto (2013) compared crying with behavioural characteristics and found there was negative correlation between the amount of total daily crying and habituation, range of state, regulation of state in premature infants. They also found that behavioural characteristics such as poor inhibition of discrete stimuli while asleep, hyper-responsivity and poor state regulation abilities were risk factors of high levels of crying. Miller et al. (2015) analyzed whether pre partum and postpartum distress in first time mothers is associated with crying, fussing behaviour and activity level in preterm infants.

Barr et al. (2014) found that preterm infants with persistent and excessive crying and fussing are found to have more difficult temperaments compared to those who cry less. White (2013) provided evidence that some preterm infants inability to soothe themselves, or to be consoled by others, were underlying causes for prolonged crying in early infancy. James Roberts (2014) found that infants with high levels of crying might have more sensitive to external stimuli and less self regulatory ability from crying state than the infants with less crying. Sighs of behaviour that infants protect themselves from disorganizing stimulation and regulate their state might be a good predictor of crying problems.

Philip Sanford Zeskind (2010) reflects a special condition of infant arousal, the high pitched hyper phonated cry of infant at risk elicits significantly stronger perceptual and physiological reactions than typical infant cries. Muller E, Hollien H & Murry T (2010) found that hyperphonated cries are those in which infant sounds “sick” and requires ameliorative care and one in which cry is perceived as unusually aversive. If a healthy newborn weighs more than 1.5 kg requires no longer continuous monitoring and the intensive care and if the infant had gained more weight and maintained a stable temperature in 26-28°C of central room temperature, later the infant can be transferred to

a small open cot. The neonate should be covered or wrapped in swaddle blankets and should wear a hat (Merenstein & Gardiner, 2011).

The above scientific reviews related to crying duration among preterm infants conclude that crying is one of the significant behavioural stress cues which influences the neuro- behaviour of the preterm infant and has impact on the growth and development of the preterm infant. Therefore it must be considered in order to promote stress free life to them.

SECTION 2.3: SCIENTIFIC REVIEWS RELATED TO SWADDLE BATH

Swaddle bath

Mitra, Maryam, Sedigheh & Zohre (2014) compared the swaddle bath and conventional bath on body temperature and crying duration, found that swaddle bath has been shown reduced temperature loss and minimal behavioural stress cues which were commonly found during conventional bath i.e., crying, back arching and extended limbs with splayed fingers. Giacoman (2010) argues that swaddle bathed preterm infants found to have improved sleep patterns after bath. Peters K.L (2012) suggests that swaddle bathed preterm infants noted with improved stability of physiological parameters and reduced behavioural stress signs of crying and fussing, which persist to be of concern with infant tub baths. Sleuwen (2010) raises the controversial issue of the probable associated risk of sudden infant death syndrome (SIDS) during swaddling of infants after one month period of postnatal age. Therefore swaddling must be done only for neonates till one month which can prevent SIDS.

Fern, Graves & Huilier (2012) found that the parents involved in swaddle bathing their infants had increased confidence in their parenting skills, which helped with their attachment and interaction with their baby and overall improved their understanding of their needs. Children's Medical Ventures (2010) found that preterm infants exhibit positive feeding after bathing, as less energy has been expended in swaddle bath.

To accurately understand the concept of swaddle bath, Neu & Brown (2012) compared the swaddle bathed preterm versus unswaddle bathed preterm infants during daily nursing practices like weighing procedures. The probable hazards found in preterm infants during weighing procedure were noted and the data obtained had given positive

effects for the swaddled preterm infants. These infants exhibited less physiological distress signs like paleness, duskiness, and reduced visceral activity, such as hiccupping and improved motor system organization with reduced arousal level from conscious state which was observed with less motor activity in general, and movements that occurred were smoother thus resulting in reduced general energy expenditure. Placing infants on the assessment scales, unswaddle bathed preterm infants resulted in displaying either poor muscle tone, with a flaccid uncontrolled posture and rigid hyperextension tone. Self regulatory infant behaviour was observed during the swaddling procedure, whereas unswaddled infants could not found, or made further no attempt to self regulate**.**

Effects of swaddle bath

Susan & Bowles (2013) found that swaddle bath sloughs dead skin cells, rehydrates skin surface, reduces infant stress and agitation, to provide comfort, promotes flexion and containment and finally provides developmentally supportive care. Infants bath can be stressful event and impact on infant's behaviour and developmental growth. Huang, Tung, Kuo & Ying-Ju (2014) found premature infants who were swaddled following a painful event returned to their baseline heart rate and oxygen saturation in shorter period of time compared to infants who were contained with blanket rolls. In a recent study (Short,2011) found that there is a positive effect on neuromuscular development among preterm infants through improved Moran Neonatal Neuro-behavioural Exam (MNNE) scores. Another study found preterm infants less than eight weeks of age demonstrated a decrease in crying times when swaddled (Van Sleuwen et al, 2011).

Swaddling an infant was found to be superior and more effective in crying infants compared to infant massage. Infants in the swaddle group were found to have improved behaviour regulation, improved ability to cope with stress and improved neuro-behavioural organization (Ohgi, Akiyama, Arisawa & shigemori,2010). Loring et al (2012) found infants who were swaddle bathed had less variability in body temperature and were warmer at ten and thirty minutes following swaddle bath.

An interactive bath helps parents better understand their infant and supports parent-infant attachment Karl, 2011). Fern, Graves and L Huliller (2010) also identified an increased parental comfort the swaddle bath, increased self-confidence in parenting

capacity and skills, facilitated parent infant attachment, enhanced much more interaction with the baby and decreased parental stress during the swaddle bath. Medves and 'O' Brien (2012) compared thermoregulation between preterm infants bathed by a parent and infants bathed by a nurse. The authors found newborns heat loss during a bath is not associated with who performs the bath and encourages parents to be actively involved in bathing their newborn.

Research study (Liaw J, Yang, Yin, Yuh, 2013) describes that with the concerns highlighted within the reviews surrounds the existing method of bathing method among preterm infants. Therefore alternative approaches to the bathing procedure need to be considered. The study also decided to promote tub bathing using swaddling techniques during the bath which has impact on the behavioural health of infant. This concept has been promoted by Children's Medical Ventures by introducing the developmental bathing system using a Tiny Tub (Children medical ventures, 2015).

Multiple researchers (Lawhon G, 2011; Als H & Duffy, 2013; Fern D Graves, 2014) found that there is minimal recognition of swaddle bathing technique within the literature and minimal research studies were conducted till date regarding the diverse benefits of swaddle bathing technique versus traditional unswaddle tub bathing technique among preterm infants. With the concept of swaddling the preterm infants, historically a research has been indicated that swaddled preterm infants have found with improved sleep patterns (Giacoman S & Lipton E, 2011). However, in a study (Sleuwen B & Engelberts, 2011) researcher contributes that this swaddling technique has a controversial issue regarding the possible associated risks of sudden infant death syndrome during swaddling technique for preterm infants. However, largely through research study (Campos G & Walden M, 2010) into preterm infant pain, swaddling has been recognized as improving the physiological stability of parameters and reducing behavioural stress signs of crying and fussing, which continue to be a primary concern with other bathing smethod using tub for infant bath.

The above scientific reviews related to swaddle bath conclude that although newborn baths are essential to prevent the transmission of communicable diseases through blood and bloody fluid following the delivery of an infant, they can be developmentally appropriate and family centered. Therefore contemplation should be

given to the benefits of swaddle bathing in relation to thermal stability of preterm infants, parent involvement during bath and parent satisfaction after bath in order to enhance optimum transition to extra uterine life of infant and to promote family- centered care. Transitioning of bath to the swaddle bathing method, the stable preterm infants as well as healthy term infants must be given priority in mother baby units, preterm ward and NICUs. The utilization of the best method skin to skin warming technique or kangaroo mother care for regaining the temperature loss found to be beneficial to the preterm infant to complement thermal regulation which is a safe practice and supports parental involvement and thus gives satisfaction.

SECTION 2.4: SCIENTIFIC REVIEWS RELATED TO CONVENTIONAL BATH

Conventional bath

Conventional bath is type of bath which was practiced in various hospital settings. They can be tub bath, sponge bath, lap bath and bath currently using in various hospitals is 'bath with wet wipes', where in these conventional baths were given from head to trunk. Multiple Researchers (You Mun, Hwang, Kim, Pyeon,2013) compared the diverse effects of different bathing methods from head to trunk versus trunk to head, the results indicated that mean body temperature loss was 1.2^0c after bathing method in group A (head to trunk) than group B (trunk to head). Chang B & Shin M (2013) found that during the conventional bathing method, the heat loss is varied due to evaporation-mechanism of heat loss.

Bryanton, Walsh, Barrett & Gaudet (2013) compared the varied effects of tub bathing method and sponge bathing method for preterm infants and results found that tub bathed preterm infants had experienced significantly minimal temperature loss and significantly more contained than those who were sponge bathed. They hypothesized that late preterm infants achieved significantly improved thermoregulation during and after immersion tub bathing than traditional sponge bathing. AWHONN guidelines (2012) support the hypothesis of a research study that the late preterm infants who are tub bathed had experienced significantly less body temperature variations and on overall there was higher body temperature after the bathing procedure. Loring et al (2012) compared preterm infants body temperature before and after tub and sponge bathing, reported that the preterm infants in the tub bathing group showed significantly less temperature changes than those in the sponge bathing group.

Effects of conventional bath

Mitra edraki, Maryam paran, Sedigheh Montaseri (2014) identified the multiple effects of conventional bath on various parameters like body temperature and crying duration. They found that mean temperature loss was significantly high and the crying duration was found to be higher in preterm infants bathed conventionally. Researchers (Tapia, Mendoza, Uscanga, 2014) found that in conventional bath method, temperature and oxygen saturation was found to be decreased and heart rate, respiratory was found to be raised.

Hall.K (2014) found that bathing found to be nerve-racking experience for newborns, especially preterm infants. Multiple studies (Liaw JJ, Yang L, Yuh YS & Yin T, 2010) found the effects of conventional bathing method on behavioural distress and found with signs of crying, fussing, hiccoughing, yawning, tremoring, trunkal flaccidity, facial flaccidity, extremities flaccidity, arching, finger splaying, grimacing and tongue extension. In addition, the conventional bathing method used in most of NICU's in the country does not seem to be evidence based and safe method for preterm infants.

Traditionally, sponge baths were given for both term and preterm infants until the umbilical cord fall; later tub baths were introduced into nursing practice (Bryanton J, Walsh D, Barrett M & Gaudet D, 2010). On the other hand, infants born prematurely continued to follow sponge bath as part of their routine nursing care biweekly or daily during their prolonged period of hospitalization in NICU (Peters K L, 2011). It was assumed that this nursing practice reduced the risk of bacterial colonization and thus nosocomial infection.

Researcher (Boxwell G, 2013) understood that this nursing practice reduced the risk of infection and further bacterial colonisation, a life threatening trouble for all preterm and term infants. Conversely, later research conducted by comparing sponge bathing and tub bathing in which the results indicated that there was no significant difference in infection rates among preterm and term infants in NICU (Peters KL, Henningson A, Nystrom B, Tunnell B, Frank &Quinin, 2013).

Researchers (Peters K L, Lee H k & Liaw J, 2013) found that in actual fact, the conventional bath called as "easy bath" i.e., wiping with wet wipes posed more of risk

due to significant heat loss during bath due to evaporation and also resulted with physiological alterations including changes in heart rate, oxygen saturation and detrimental behavioural cues like crying, whimpering and thrashing. Adding together, the procedure of sponge bathing was not supportive of family centered care as nurses in NICU were reported as performing the procedure in the middle of the nights when they had more time available to give bath, in which the mother or family was never involved during that period (Peters K L, 2013).

A study (Lee H k, 2013) had switched away bathing procedures from sponge bath to easy bath as routine nursing care to the preterm and term infants currently used today. If there were critically ill infants in NICU, they are no longer bathed as it is recognized to be detrimental factor to their well being; minimal handling of infant is now encouraged and recommended in order to reduce stress on physiological parameters. Though there was a recognition that newborns appeared to be comforted through immersion bath with warm water of temperature 100-101^{0}F. Several studies (Cole J.G, Brisstte N J & Lundardi B, 2014) have suggested that once an infant is considered as stable, then bath should be given by using tub bathing technique for the participation and involvement of the mother and family during bath. It was assumed that the tub simulates the intra-uterine environment for the baby, with the submersion of preterm infant into water seems a familiar and secure feeling to the infant (Filho LC, 2013).

Research study (Cole J.G, Bristte N J & Lundardi B, 2013) found that even though tub bathing was considered to be a more pleasurable experience for both preterm infant and the family for the interaction, it is still extensively accepted within civilization that bathing continues to be a stressful experience for healthy newborns, which results as most babies keep crying throughout the bathing procedure. Liaw et al. (2013) considered research among preterm infants and acknowledged that papers on bathing in the literature have predominantly focused on traditional sponge bathing techniques. A study (Liaw, Yang, Yin & Yuh, 2011) is currently based on evidence informed practice and found that preterm infants who were tub bathed continued to display alterations in heart rates and oxygen saturation levels with numerous behavioural distress cues. Thus it rose with further questions regarding the benefit of tub bathing among vulnerable preterm infants.

The above scientific reviews related to Conventional bathing method concluded that this was a simplest form of bath and time saving nursing procedure but still there are variations of temperature, heart rate, respiratory rate and oxygen saturation among preterm infants who were bathed conventionally with wet wipes and sponge clothes and found to cause behaviour distress cues like crying and fussing which must be primarily considered.

SECTION 2.5: SCIENTIFIC REVIEWS RELATED TO PHYSIOLOGICAL PARAMETERS OF PRETERM INFANTS

Physiological parameters

Physiological parameters are the parameters of preterm infants adaptation to environment which varies and found to be unique for all the individuals. They include temperature, heart rate, respiratory rate and oxygen saturation.

Tapia-Rombo CA, Mendoza & Carrasco (2013) determined that the sponge bath is not safe for a preterm infant and this should be performed in the shortest time possible, and the medical must be very alert to the possibility that patients require more support than they had prior to sponge bathing, inspired fraction of oxygen for the required time according to the evolution of these variables.

Tapia-Rombo & Uscanga-Carrasco H (2010) found Variations of vital signs and peripheral oxygen saturation in preterm newborn, after sponge bathing. BMJ Best Practice (2011) contributes that if heart rate among preterm infants is less than 100 beats per minute, should be given additional oxygen, or fluids through a drip. If heart rate drops below 60 beats per minute, the team will need to carry out cardiopulmonary resuscitation (CPR) - pumping the chest to push blood from the heart to the rest of the body. They may also need to give fluids and medication through a drip to preterm infants.

BMJ Best Practice (2011) found that one or two in five areas heart rate, breathing, muscle tone, reflex (crying or moving away in response to stimulation),skin colour. The total figure is added up to provide a maximum score of ten, although babies seldom get the top score. Premature babies often have lower scores because of three key factors such as muscle tone, colour and reflex which depends on the preterm infant age

Peters K L & Amit J (2013) found that Physiological and behavioural disruptions occurred throughout the bath phase and in many cases beyond that phase. These disruptions included significant increases in heart rate, cardiac oxygen demand, and frequency of behavioural motoric cues. Significant decreases in oxygen saturation also accompanied the bath. Nine infants required increased concentrations of ambient oxygen. A significant association was found between physiological components and the frequency and timing of behavioural cues. The results provide further evidence that routine care is not innocuous to neonates. Routine sponge bathing is not recommended for care of ill premature infants.

Researchers (Campos G & Walden M,2010) contributes that swaddling technique is considered among neonates by improving the physiological stability of parameters and reducing behavioural distress signs like crying and fussing, which assumed to be a major concern in case of tub bath. Liaw et al. (2013) considered extensive research among preterm and term infants, therefore acknowledged that scientific papers on bathing methods in the review of literature have predominantly focused on traditional sponge bathing techniques. Research study (Liaw, Yang, Yin &Yuh, 2011) currently based on evidence practice and preterm infants who were tub bathed continued to exhibit alterations and variations in heart rates and oxygen saturation levels, with most frequent behavioural distress cues.

Researchers (Tapia, Mendoza & Uscanga, 2014) found that in conventional bath method, temperature and oxygen saturation was found to be decreased and heart rate & respiratory was found to be raised. If there were critically or acutely ill infants must not be given bath for longer period as it is recognized to be detrimental factor for their well being. Therefore hospitals recommend having minimal handling of preterm infants to reduce stress with suboptimal physiological ranges (Lee HK, 2013).

Researchers (Peters. K L, Lee. H K & Liaw. J, 2013) concluded that in actual fact, the sponge bath found with and posed more of risky due to significant heat loss and thermal variations with physiological alterations including changes in heart rate, respiratory rate and oxygen requirements and saturation levels, with detrimental effects of behavioural distress cues like crying, wimpering and thrashing. AWHONN (2012) support the hypothesis that late preterm infants who were tub bathed, experienced with

significant less body temperature variations and on overall incidence with higher body temperature after the bathing procedure. Loring et al. (2012) compared the difference of preterm infants body temperature before and after tub or sponge bathing, reported that the preterm infants in the tub bathing group showed significantly less temperature changes comparatively with those in the sponge bathing group.

Multiple Researchers (You Mun, Hwang, Kim & Pyeon,2013) compared the effects of bath from head to trunk and trunk to head, they found that mean body temperature was dropped to 1.2^0c after bathing in head to trunk group than trunk to head group. Chang B & Shin M (2013) found that in conventional bath, the heat loss is due to evaporation. Huang, Tung, Kuo & Ying-Ju (2014) found premature infants who were swaddled following a painful event returned to their baseline heart rate and oxygen saturation in shorter period of time compared to infants who were contained with blanket rolls.

The above scientific reviews related to physiological parameters conclude that due to medical and nursing practices, the physiological parameters are varied with respect to feeding practices, temperature, heart rate, respiratory rate and oxygen saturation, weight gain, sleep patterns.

SUMMARY

The above literatures were selected to provide high quality nursing care to the preterm infant with scientific knowledge. During the search process, the investigator found the gaps in the literatures as they were dealt with the impact of physical, behavioural and physiological components with regards to swaddle bath and conventional bath individually. So the investigator attempted to bridge the gap between the physiological and behavioural components in swaddle bath and conventional bath which has an impact on preterm infant by undertaking this study on level of thermal stability(physiological impact) and crying duration(behavioural impact) among preterm infants. During the process of review of literature, the investigator felt difficulty in gathering Indian literatures pertaining to the topics, swaddle bath and conventional bath .The Indian studies were done in minimal number of samples which does not deal with generalization of the results in preterm population.

CHAPTER – 3

RESEARCH METHODOLOGY

RESEARCH METHODOLOGY

The methodology is the significant part of any research study which will enable the researcher to project a blue print of the research.

This chapter describes the methodology adopted in this study to assess the relative effectiveness of swaddle bath and conventional bath on the level of thermal stability and crying duration among preterm infants at selected hospital, Surat. This phase of the study deals with the research design , variables, settings of the study, population, sample, inclusive and exclusive criteria for sample selection, sample size, sampling technique, development and description of the tool and plan for data analysis.

3.1 RESEARCH APPROACH

Quantitative Research Approach.

3.2 RESEARCH DESIGN

The research design ventured for this study was a true experimental comparative research design. According to **Polit and Beck (2012),** the strength of a true experimental lies in the fact that experiments can achieve greater confidence in the genuineness of causal relationships because they are observed under controlled conditions. The investigator assumed that there will be difference in physiological parameters and crying duration observed in preterm infants after the different kinds of bath i.e., swaddle and conventional bath , therefore the investigator had adopted true experimental comparative research design in order to compare the relative outcome of swaddle bath and conventional bath. A true experimental research design is characterized by the following three properties:

- **Randomization –** The investigator assigned the participants to study or control group on a random basis by simple random (lottery method) and pair matching was done with respect to variables of gestational age, gender and place of preterm infant before bath in order to maintain homogeneity.
- **Control –** The investigator introduced control over the experimental situation. The investigator had a control group i.e. conventional bath is control for group A (swaddle bath) and swaddle bath is control for group B (conventional bath)

- **Manipulation** – The investigator performed swaddle bath on group A and conventional bath on group B

The schematic representation of true experimental study is depicted as follows:

R A N D O M I Z A T I O N	Group	Pre test (Before bath) (O_1)	Intervention (×)	Post test (After bath) (O_2) & (O_3)
	Group A	Assessment of the pre test level of thermal stability among preterm infants by checking physiological parameters 10minutes before the bath based on W.H.O guidelines.	**Swaddle Bath :** The bath given once by the investigator to the preterm infant for 5minutes, in which the preterm infant was snuggly wrapped with autoclaved thick soft towel, maintaining in a flexed midline position and placed in the tub filled with warm water with the temperature of 100-101°Fahrenheit and immersed till shoulder level. Then each part of the body is individually unwrapped, washed with mild soap, rinsed from lower and upper limbs, trunk to head and rewrapped.	Assessment of the post test level of thermal stability by checking Physiological parameters at 10^{th} and 30^{th} minute after bath based on W.H.O guidelines and post test crying duration by calculating crying percentage during the bath among preterm infants
	Group B		**Conventional Bath :** The easy bath given once by the investigator to the preterm infant by exposing the body and wiped with wet wipes from face to neck, trunk, limbs, genitals and back, for the duration of 5minutes.	

3.3. VARIABLES

3.3.1 Independent Variables

The independent variables of the study were swaddle bath and conventional bath

3.3.2 Dependent Variables

The dependent variables of the study were level of thermal stability and crying duration among preterm infants.

3.3.3 Extraneous Variables

It consists of gestational age, mode of delivery, postnatal age of preterm infant, APGAR score at 5^{th}min, gender, birth weight, weight before bath, type of feed, frequency of feeds in a day , time of last feed before bath, place of preterm infant before bath.

3.4 SETTING OF THE STUDY

The study was conducted in Anand Hospital, Surat. It is private with 250 bedded hospital exclusively for paediatric speciality, where investigator performed her study in 25 bedded NICU, where in, 15 beds are for preterm infants in which around 15- 20 preterm infants get admitted weekly.

3.5 POPULATION

3.5.1 Target Population

All preterm infants born between 30-36 weeks of gestation.

3.5.2 Accessible Population

Preterm infants born between 30-36 weeks of gestation, who were admitted in NICU at Anand Hospital, Surat.

3.6 SAMPLE

Preterm infants born between 30-36 weeks of gestation who fulfilled the inclusion and exclusion criteria were selected as participants and pair matching was done based on gestational age, gender of preterm infant and place of preterm infant before bath in both group A and group B.

3.7 SAMPLE SIZE

The Sample size comprised of 60 preterm infants (30 participants in group A & 30 participants in group B). Hence 30 in each group who fulfilled the sample selection criteria were randomly assigned to group A and group B.

3.8 SAMPLING TECHNIQUE

Simple random sampling technique – lottery method was adopted for the study.

3.9 CRITERIA FOR SAMPLE SELECTION

3.9.1 Inclusive Criteria

1. Preterm infants born between 30 – 36weeks of gestation
2. Preterm infants with stable physiological parameters (Temperature >35^0c & <37.5^0c, Heart rate 120-170beats/min, Respiratory rate 40-70breaths/min and Oxygen saturation 90-94%) based on their gestational age and after the umbilical cord fall.
3. Preterm infants with weight before bath >/=1500gms.
4. Preterm infants who are admitted in NICU, Anand Hospital.

3.9.2 Exclusive Criteria

1. Parents of preterm infants who are not willing to participate.

3.10 DEVELOPMENT AND DESCRIPTION OF THE TOOL

After an extensive review of literature, discussion with experts in the field of Paediatrics, the investigator's personal and professional experiences, the W.H.O guidelines for physiological parameters (temperature, heart rate, respiratory rate, oxygen saturation) and crying percentage formula for calculating crying duration were adapted as the tool for the study.

The tool constructed in this study consisted of two parts:

3.10.1 Data collection tool: This consisted of 3 sections

Section A: Assessment of demographic variables

Section B: W.H.O guidelines for physiological parameters to assess thermal stability of Preterm infants

Section C: Crying percentage formula to assess crying duration

3.10.2 Intervention tool: This consisted of 2 sections

Section A: Swaddle Bath

Section B: Conventional Bath

3.10.1 DATA COLLECTION TOOL

Section A: Assessment of demographic variables

Structured interview schedule and medical record review was used to assess the demographic data. It consisted of demographic variables such as gestational age, mode of delivery, postnatal age of preterm infant, APGAR score at 5^{th}min, gender, birth weight, weight before bath, type of feed, frequency of feeds in a day, time of last feed before bath, place of preterm infant before bath.

Section B: W.H.O Guidelines for checking physiological parameters of Preterm infants to assess thermal stability.

Parameters	Inference	Range
Temperature(^{0}c)	Hyperthermia	>37.5
	Normal	36.5-37.5
	Mild hypothermia	36.4-35.2
	Moderate hypothermia	32-35.1
	Severe hypothermia	<32
Heart Rate(beats/min)	Tachycardia	>170
	Normal	120-170
	Bradycardia	<120
Respiratory rate (breaths/min)	Tachypnoea	>70
	Normal	40-70
	Bradypnoea	<40
Oxygen saturation (%)	Normal	92-94
	Mild desaturation	90-91
	Moderate desaturation	88-89
	severe desaturation	<88

Source: "Thermal control of the Preterm's, a practical guide. WHO

Section C: Crying percentage formulae for calculating crying duration

To record the crying duration, the preterm infants faces were filmed in close-up from the beginning till the end of the bath using digital camera, crying duration was obtained by calculating crying percentage using formula,

$$\text{Crying percentage} = \frac{\text{Crying duration}}{\text{Total bath time (minutes)}} \times 100$$

Crying Duration is Assessed & Interpreted By:

- A computer with media player software was applied for viewing each recording session of crying during bath. The preterm infants faces were videotaped and interpreted by the staff nurse and the neonatologist of Anand Hospital in order to determine the crying duration.

3.10.2 INTERVENTION TOOL

GROUP – A: SWADDLE BATH

Time : 5mins

Method : one -to -one

Venue : Procedure room

- **Pre-Procedure:** After gaining informed written consent from the parents regarding intervention, its time and duration, the investigator explained the intervention to the parents that intervention will be given to preterm infants in the morning between 5am -11am

Preparation of articles:

Articles	Number	Rationale
• A clean tray containing :		
Digital thermometer	1	To check temperature before and after bath
Stethoscope	1	To check heart rate before and after bath
Portable pulse oximeter	1	To check Oxygen Saturation before and after bath
Bath thermometer	1	To check water temperature before bath
Kidney tray	1	To receive the waste
Autoclaved Swaddle cloth	2	To wrap the baby before and after bath
Towel	1	To dry the preterm infant
Cotton balls in a container	2	To clean the eyes during bath
Mild foamless soap	1	To remove dirt from body
Diaper	1	To collect urine and stool
• Bath tub	1	To bath the baby

Preparation of environment: The investigator arranged all the necessary articles and switched off the fan, maintained the room to atmospheric temperature.

Preparation of preterm infant: The investigator checked the physiological parameters 10minutes before bath and then checked whether the baby is wet with urine or stool. When the preterm infant was wet, cleansed the baby at the bedside and checked weight before bath, swaddled the baby with autoclaved thick soft towel in which preterm infants hands brought to face, hands and legs in flexed midline position and performed eye care from inner canthus to outer canthus by one stroke using separate swabs for each eye and washes the face.

Preparation of the investigator: The investigator arranged all the necessary articles at bedside and wore cap, mask and performed hand hygiene.

- **During Procedure**: The investigator placed preterm infant in tub of warm water of temperature 100°-101° F immersing till shoulders supported infant's shoulders and head at all times. The investigator given bath with mild foamless soap and water, initiated as unswaddled, washed and reswaddled the left leg then unswaddled, washes and reswaddled the other leg one at a time and then unswaddled, washed and reswaddled both the hands one at a time. Then washed the infant's neck, trunk, abdomen, genital area and back. Reswaddled the infant again and finally washed the head. The investigator unswaddled the infant and taken infant from the tub. The whole procedure was recorded using video camera with the help of research assistant.

S.No.	Steps	Duration (Minutes)
1.	Unswaddles, washes and reswaddles both the legs one at a time.	1
2.	Unswaddles, washes and reswaddles both the hands one at a time.	1
3.	Washes the infant's neck, trunk, abdomen and genital area	1
4.	Washes the infants back by reswaddling trunk	1
5.	Washes the head by reswaddling the body	1
	Total	**5**

- **Post Procedure:** The investigator dried the baby completely and puts diaper, mummified and given to mother for feeding. The investigator checked temperature at the 10^{th} and 30^{th} minute after the bath procedure. Preterm infants were then allowed to perform their routine activities.

GROUP-B: CONVENTIONAL BATH

Time : 5mins

Method : one -to -one

Venue : Procedure room

- **Pre Procedure:** After gaining informed written consent from the parents regarding intervention, its time and duration, the investigator explains the intervention to the parents that intervention will be given to preterm infants in the morning between 5am -11am.

Preparation of articles:

Articles	Number	Rationale
A Clean tray containing:		
Digital thermometer	1	To check temperature before and after bath
Portable pulse oximeter	1	To check heart rate before and after bath
Stethoscope	1	To check Oxygen Saturation before and after bath
Wet wipes	4	To bath the baby for wiping body
Towel	2	1 to receive the preterm infant before bath 1 to mummify the preterm infant after bath
Cotton balls in a container	2	To wipe the eyes of preterm infant during bath
Kidney tray	1	To receive the waste
Diaper	1	To collect the stool and urine

Preparation of environment: The investigator arranges all the necessary articles and puts off the fan, maintaining the room to atmospheric temperature.

Preparation of preterm infant: The investigator checks the physiological parameters 10minutes before bath and then checks whether the baby is wet with urine or stool. If

wet, cleanses the baby at the bedside and checks weight before bath after which wipes the infant's eyes from inner canthus to outer canthus using separate swabs for each eye in one stroke .

Preparation of the investigator: The investigator arranges all the necessary articles at bedside and wear cap mask and performs hand hygiene.

- **During Procedure :** The investigator receives preterm infant and gives bath using wet wipes starting from the infant's face and neck to hands ,trunk, abdomen, genitals, lower limbs and back using wet wipes and ends the bath. The whole procedure will be recorded using video camera with the help of research assistant.

S.No.	Steps	Duration (Minutes)
1.	Wipes the infant's face and neck using wet wipe	1
2.	Wipes both the hands of the infant using wet wipe	1
3.	Wipes the infant's neck, trunk, abdomen and genital area using wet wipe	1
4.	Wipes the infants back using wet wipe	1
5.	Wipes both the legs one at a time using wet wipes	1
	Total	**5**

- **Post Procedure:** The investigator dried the baby completely and puts on diaper, mummified and given to mother for feeding. The investigator checked temperature at the 10^{th} and 30^{th} minute after the bath procedure. Preterm infants were then allowed to perform their routine activities.

3.11 CONTENT VALIDITY

The content validity of the scale was ascertained from the following field of expertise

Neonatologist - 1
Pediatric consultant - 1
Pediatric Nursing Specialist - 2

All the 4 experts had given their consensus, the additions and suggestions given by the experts were incorporated in the tool, and the tool was finalized

3.12 ETHICAL CONSIDERATION

The study was approved by the institutional ethical review board, International Centre for Collaborative Research (ICCR) of Omayal Achi College of Nursing and ethical principles were followed in the study.

A) BENEFICENCE

- **Freedom from harm and discomfort**

  The study participants were prevented from unnecessary risk of harm during the study period as "No harm certificate" was taken from the administrators of the Anand Hospital before giving intervention and the investigator used autoclaved linen for the intervention and followed universal precautions during the intervention. The care givers of the preterm infants were given full freedom to disclose their view of discomfort that they feel during the course of the study.

- **The right to protection from exploitation**

Care givers of the preterm infant were assured that participation of their preterm infant or information provided by them would not be used against them. The investigator completely explained the procedure. The investigator explained the procedure and nature of the study and ensured that the participants in both the group A and group B would not be exploited in any cost or denied from fair treatment.

B) RESPECT FOR HUMAN DIGNITY

The investigator followed the second ethical principle of respect for human dignity. It includes the right to self determination and right to self disclosure.

- **The right to self determination**

The investigator has provided full freedom to the care givers of the preterm infants to decide voluntarily about the participation of their preterm infants in the study and the right to ask any question during the course of the study.

- **The right to full disclosure**

The investigator has fully described the nature of the study; the care giver's right to refuse participation and written informed consent was obtained from the parents.

C) JUSTICE

The investigator adhered to the third ethical principle of justice. It includes participant's right to fair treatment and right to privacy.

- **Right to fair treatment**

The investigator selected the study participants based on the inclusion and exclusion criteria and divided them into group A and group B. Both the groups were given equal consideration with regard to safety, privacy, and aseptic technique throughout the study period. If the preterm infants have minimal parameters, the investigator given justice by providing intervention to maintain optimum parameters.

- **Right to privacy**

The investigator maintained the study participant's privacy through confidentiality pledge obtained through oral consent from the Neonatologist of Anand hospital and ensured that the video recordings of the crying of each infant are used only to interpret the crying duration and was discarded immediately after interpretation of the crying duration.

D) CONFIDENTIALITY

The investigator maintained confidentiality of the data provided by the study participants through individual coding for each participant.

3.13 RELIABILITY

The reliability of the tool was analyzed by inter - rater method for both thermal stability and crying duration , where 10 preterm infants were selected and segregated into group A and group B using lottery method. The tool was assessed by the investigator and equally competent M.Sc (N) scholar at RSRM (Raja Sir Ramaswamy Mudaliar) hospital for all the 10 participants. The reliability score obtained was **r = 0.9**. The 'r' value indicated the highly positive correlation, which showed that the tool was reliable for conducting the main study.

3.14 PILOT STUDY

Pilot study is the trial run for the main study. The refined tool was used for pilot study to test the feasibility and practicability.

Formal administrative approval was obtained from the International Centre for Collaborative Research (ICCR), Principal, Omayal Achi college of Nursing. The investigator had got official administrative approval from the hospital administrators, Head of the department of NICU and the data collection was done at RSRM hospital, Chennai. A brief introduction about self and purpose of study was explained to parents and written informed consent was obtained from them. Confidentiality regarding the data was assured so as to get cooperation throughout the procedure of data collection period.

Data collection was done for a period of one week and the investigator worked from morning 8am to 11am for the completion of scheduled intervention based on the stratification of demographic data collected and inclusion and exclusion criteria, 10 participants were selected by using lottery method, depending on the number of admissions on daily basis. Pair matching was done for selected demographic variables of gestational age, gender and birth weight after which investigator divided into 5 in group A and 5 in group B.

The investigator assessed the level of thermal stability by checking physiological parameters 10minutes before giving intervention and at 10^{th} & 30^{th} minute after the intervention, crying duration was assessed by calculating crying percentage for all the selected participants. The group A was given swaddle bath and group B was given conventional bath.

3.15 PROCEDURE FOR DATA COLLECTION

Data collection procedure was done in Anand Hospital, Surat. Formal administrative approval was obtained from the International Centre for Collaborative Research (ICCR), Principal, Omayal Achi College of Nursing, the Administrators, Medical director, Neonatologist of NICU, Surat.

A brief introduction about self and purpose of study was explained to parents and written consent was obtained from them. A clear explanation of the intervention was given by the investigator and the NICU doctors. Confidentiality regarding the data was assured so as to get cooperation throughout the procedure of data collection period.

Data collection was done for a period of 4weeks and the investigator worked from morning 5am to 11am daily for the completion of scheduled intervention. Based on the stratification of demographic data collected and the inclusion and exclusion criteria, participants of preterm infants were selected through lottery method. Depending on the number of admissions on daily basis, Pair matching was done for selected demographic variables such as gestational age, gender and place of preterm infant before bath and after which the investigator divided participants equally into group A and group B.

On the first day, the investigator selected 8 preterm infants based on inclusion and exclusion criteria, pair matching was done and divided them into 4 under group A and 4 under group B by lottery method, where in group A were given swaddle bath and group B were given conventional bath. Likewise on the third day 6 preterm infants were selected and fifth day 4 preterm infants were selected and on 9^{th} day 6preterm infants were selected and on 13^{th} day 6 preterm infants were selected. Thus after finishing these 30 preterm infants (15 group A and 15 group B), the next set of preterm infants were selected and the same procedure was followed for the other set of preterm infants. 8 participants were selected on 19^{th} day and on 23^{rd} day 6 participants were selected and on 27^{th} day 4 participants were selected and on 30^{th} day 8 participants were selected and on 32^{nd} day 4 participants were selected. Thus the overall time period taken for the data collection and intervention was 32 days

To begin with, the investigator conducted a pre test 10 minutes before bath and recorded the physiological parameters based on W.H.O guidelines. Swaddle bath was given once to group A for 5 minutes and conventional bath was given once to group B for 5 minutes during the intervention phase. Post test was conducted at 10^{th} minute and 30^{th} minute after bath procedure. Post test of crying duration was assessed and interpreted by using video recordings which was taken by research assistant during bath and crying percentage was calculated by using formula.

During the intervention, thorough asepsis was maintained by the investigator by frequent and regular hand washing before touching preterm infant and also linen for swaddling was sent for autoclaving twice daily. There was no attrition experienced during the study and relative effectiveness of the interventions was witnessed by the investigator and recorded.

3.16 PLAN FOR DATA ANALYSIS

Data was analyzed by using both descriptive and inferential statistics.

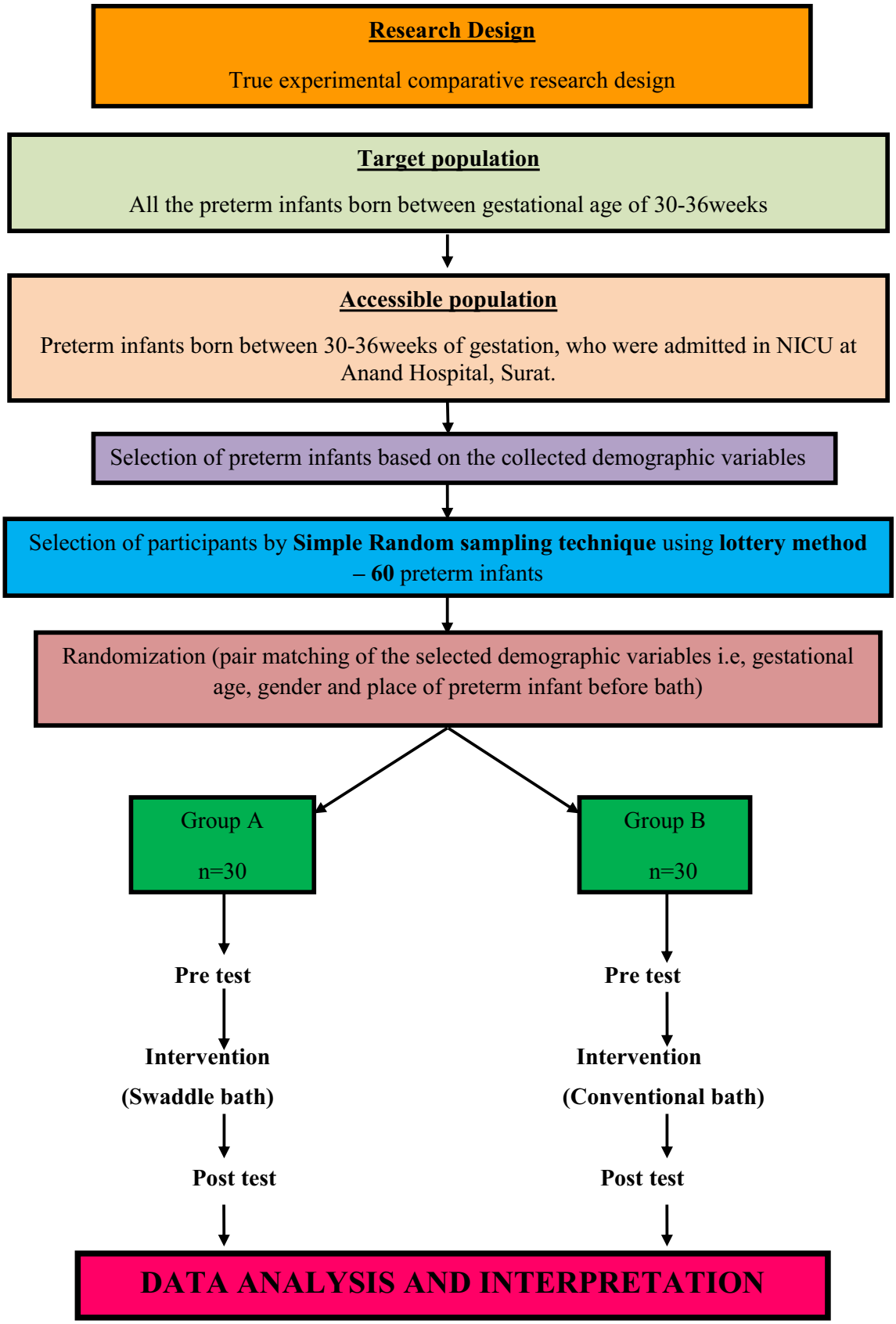
3.16.1 Descriptive Statistics

1. Frequency and percentage distribution was used to analyze the demographic data of preterm infants.
2. Mean and standard deviation was used to assess the level of thermal stability and crying duration among preterm infants undergoing swaddle bath and conventional bath procedure**.**

3.16.2 Inferential Statistics

1. Paired and Unpaired 't' test was used to compare the data within and between the group A and group B.
2. Correlation Coefficient was used to find out the relationship of post test level of thermal stability with post test crying duration in group A and group B.
3. Chi-square test was used to test the homogeneity of demographic variables and One way ANOVA was used to associate the selected demographic variables with the mean score of thermal stability and mean score of crying duration among group A and group B.

SCHEMATIC REPRESENTATION OF RESEARCH METHODOLOGY



CHAPTER – 4

DATA ANALYSIS AND INTERPRETATION

DATA ANALYSIS AND INTERPRETATION

This chapter deals with analysis and interpretation of the data collected from 60 preterm infants (30 – Group A (Swaddle Bath) and 30 – Group B (Conventional Bath) to study the relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants at selected hospital, Surat. The data collected was organized, tabulated and analyzed according to the objectives. The findings based on the descriptive and inferential statistical analysis are presented under the following sections.

ORGANISATION OF THE DATA

Section 4.1: Description of demographic variables of preterm infants in Group A and Group B.

Section 4.2: Assessment of pretest and post test level of thermal stability among preterm infants in Group A and Group B.

Section 4.3: Assessment of post test crying duration among preterm infants in Group **A** and Group B.

Section 4.4: Relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants.

Section 4.5: Correlation of post test mean score of thermal stability with post test mean score of crying duration among preterm infants in Group A and Group B.

Section 4.6: Association of selected demographic variables with the mean score of thermal stability and mean score of crying duration among preterm infants in Group A and Group B.

SECTION 4.1: DESCRIPTION OF DEMOGRAPHIC VARIABLES OF PRETERM INFANTS IN GROUP A AND GROUP B.

Table 4.1.1: Frequency and percentage distribution of demographic variables of preterm infants in Group A and Group B with respect to gestational age, mode of delivery, post natal age and APGAR score at 5thmin.

N = 60

S. No.	Demographic Variables	Group A (Swaddle bath) n=30		Group B (Conventional bath) n=30		Chi square value
		No.	%	No.	%	
1.	**Gestational age in weeks (Pair Matched)**					$\chi^2 = 0.000$ df=5 P = 1.000 N.S
	30	-	-	-	-	
	31	1	03.3	1	03.3	
	32	3	10.0	3	10.0	
	33	3	10.0	3	10.0	
	34	**13**	**43.3**	**13**	**43.3**	
	35	5	16.7	5	16.7	
	36	5	16.7	5	16.7	
2.	**Mode of delivery**					$\chi^2 = 1.76$ df=1 P = 0.184 N.S
	Normal vaginal delivery	**21**	**70.0**	**16**	**53.3**	
	Caesarean delivery	9	30.0	14	46.7	
	Others	-	-	-	-	
3.	**Postnatal age**					$\chi^2 = 14.586$ df=3 P =0.002 S**
	1 wk (7 days)	1	03.3	6	20.0	
	2 wks (8 - 14 days)	6	20.0	**14**	**46.7**	
	3 wks (15 - 21 days)	**17**	**56.7**	10	33.3	
	4 wks (22 - 30 days)	6	20.0	-	-	
4.	**APGAR Score at 5th minute of birth**					$\chi^2 = 3.360$ df=1 P = 0.067 N.S
	<5	-	-	-	-	
	5 – 7	**21**	**70.0**	14	46.7	
	>7	9	30.0	**16**	**53.3**	

The above illustrated table 4.1.1 describes that majority of preterm infants belongs to 34weeks of gestation and were born by normal vaginal delivery in both the groups. Majority of preterm infants had postnatal age between 8-14days and with 5-7/10 of APGAR score at 5th minute in group A and had post natal age between 15-21days and with >7/10 of APGAR score at 5th minute in group B.

Table 4.1.2: Frequency and percentage distribution of demographic variables of preterm infants in Group A and Group B with respect to gender and birth weight and weight of preterm infant before bath in grams.

N = 60

S.No.	Demographic Variables	Group A (Swaddle bath) n=30		Group B (Conventional bath) n=30		Chi square value
		No.	%	No.	%	
1.	**Gender (Pair Matched)**					χ^2 = 0.000 df=1 P= 1. 000 N.S
	Male	14	46.7	14	46.7	
	Female	**16**	**53.3**	**16**	**53.3**	
2.	**Birth weight of preterm infant in grams**					
	1500 – 1700	**13**	**43.3**	5	16.7	χ^2 = 12.586 df= 6 P= 0.076 N.S
	1701 – 1900	7	23.3	**9**	**30.0**	
	1901 – 2100	-	-	5	16.7	
	2101 – 2300	3	10.0	1	03.3	
	2301 – 2500	-	-	1	03.3	
	>2500	-	-	2	06.7	
	<1500	7	23.3	7	23.3	
3.	**Weight of preterm infant before bath in grams**					
	1500 – 1700	1	03.3	2	06.7	χ^2 =2.727 df =5 P =0.742 N.S
	1701 – 1900	9	30.0	**13**	**43.3**	
	1901 – 2100	**10**	**33.3**	5	16.7	
	2101 – 2300	5	16.7	5	16.7	
	2301 – 2500	2	06.7	2	06.7	
	>2500	3	10.0	3	10.0	
	<1500	-	-	-	-	

The above illustrated table 4.1.2 depicts that preterm infants were predominantly females in both the groups. Preterm infants were born with birth weight between 1500-1700gms in group A and 1701-1900gms in group B and weighed before bath between 561901-2100gms in group A and 1701-1900gms in group B.

Table 4.1.3: Frequency and percentage distribution of demographic variables of preterm infants in Group A and Group B with respect to type of feed, frequency of feeds in a day, time of last feed and place of preterm infant before bath.

N = 60

S.No.	Demographic Variables	Group A (Swaddle bath) n=30		Group B (Conventional bath) n=30		Chi square value
		No.	%	No.	%	
1.	**Type of feed**					χ^2 =0.888 df =2 P =0.642 N.S
	Expressed breast feed	**15**	**50.0**	**13**	**43.3**	
	Formula feed	10	33.3	9	30.0	
	Combined	5	16.7	8	26.7	
2.	**Frequency of feeds in a day**					χ^2 =4.359 df =2 P =0.113 N.S
	Every 1 hourly	11	36.7	4	13.3	
	Every 2 hourly	**13**	**43.3**	**18**	**60.0**	
	Every 3 hourly	-	-	-	-	
	On demand	6	20.0	8	26.7	
3.	**Time of last feed before bath**					χ^2 =7.788 df =3 P =0.091 N.S
	1 hour	**17**	**56.7**	7	23.3	
	2 hour	11	36.7	**13**	**43.3**	
	3hours	2	6.7	9	30.0	
	4hours	-	-	1	3.3	
4.	**Place of preterm infant before bath (Pair Matched)**					χ^2 = 0.317 df =1 P =0.573 N.S
	Open cot	**22**	**73.3**	**20**	**66.7**	
	Radiant warmer	8	26.7	10	33.3	
	Others	-	-	-	-	

The above illustrated table 4.1.3 depixcts that majority of preterm infants had received expressed breast feed and frequently received every 2hourly in a day and were on open cot both in group A and group B. They were fed 1hour before bath in group A and 2 hours before bath in group B.

Chi square test revealed that the groups, i.e., group A (Swaddle bath) and group B (Conventional Bath) had maintained homogeneity with respect to demographic variables throughout the study period.

SECTION 4.2: ASSESSMENT AND COMPARISON OF PRETEST AND POST TEST LEVEL OF THERMAL STABILITY AMONG PRETERM INFANTS IN GROUP A AND GROUP B

n=30

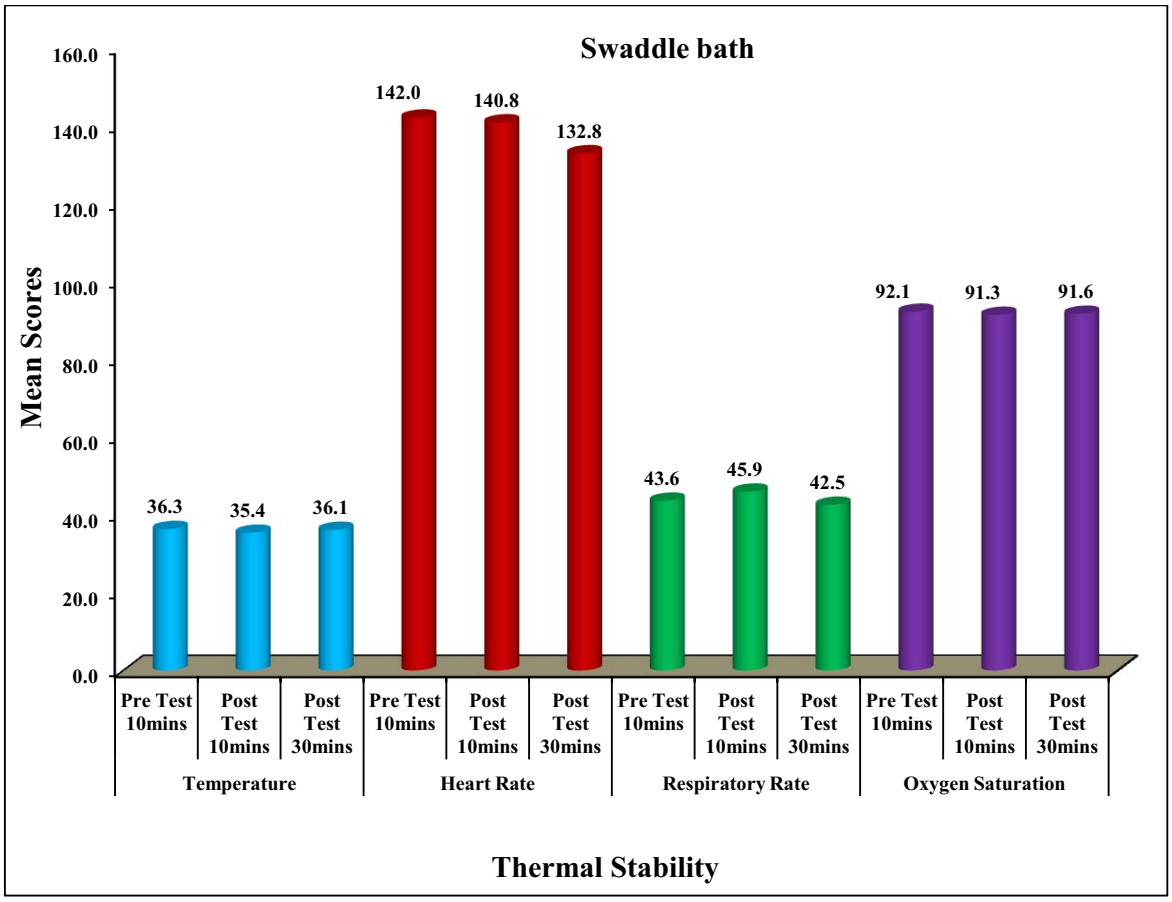


Fig 4.2.1: Assessment & Comparison of pretest and post test level of thermal stability among preterm infants in group A

The above Fig 4.2.1 describes the level of thermal stability before and after swaddle bath, the mean difference of temperature between the pre test and post test shows there was minute temperature loss of 0.9^0C at 10^{th} minute and 0.2^0C at 30^{th} minute after bath which is significant at $p<0.01$ level. The mean difference of heart rate shows there was very minute reduction in heart rate at 10^{th} minute and regaining of heart rate was found by 30^{th} minute and the mean difference of respiratory rate shows there was increased respiratory rate at 10^{th} minute and regained back to optimal range by 30^{th} minute which was significant at $p<0.05$level. The mean difference of oxygen saturation shows there was 0.7% reduction at 10^{th} minute and regaining was found by 30^{th} minute after swaddle bath at $p<0.05$level.

n=30

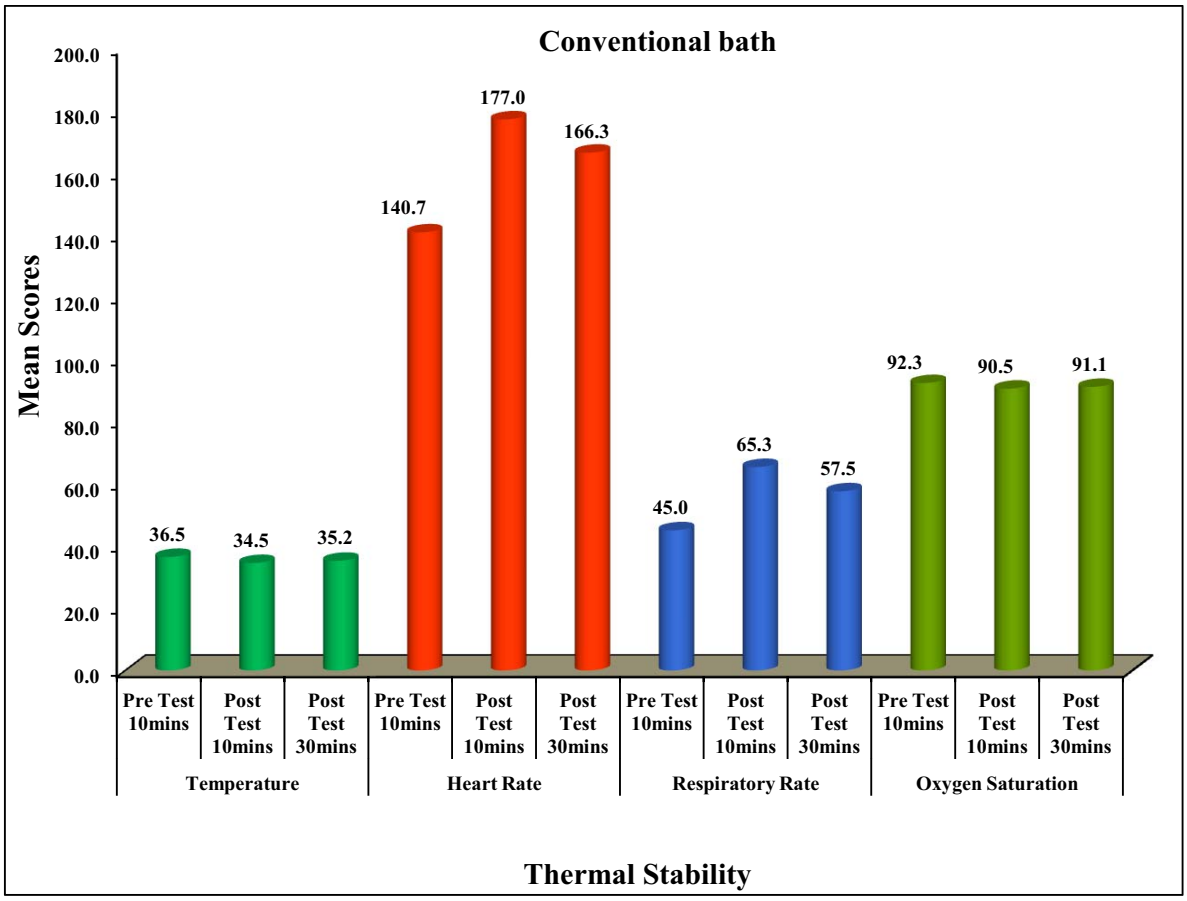


Fig 4.2.2 Assessment & Comparison of pretest and post test level of thermal stability among preterm infants in group B

The above Fig 4.2.2 describes the level of thermal stability before and after conventional bath, the mean difference of temperature between the pre test and post test shows there was high temperature loss of 2^0C at 10^{th}minute and 1.3^0C loss at 30^{th} minute which was significant at $p<0.001$ level. The mean difference of heart rate shows there was increased heart rate (Tachycardia) at 10^{th} minute and regaining of heart rate was slow by 30^{th} minute and the mean difference of respiratory rate shows there was increased respiratory rate (Tachypnoea) at 10^{th} minute and regaining of respiratory rate was slow by 30^{th} minute which was significant at $p<0.001$level. The mean difference of oxygen saturation shows there was 1.8% of reduction in oxygen saturation at 10^{th} minute and regaining was slow by 30^{th} minute after conventional bath which was significant at $p<0.00$level.

SECTION 4.3: ASSESSMENT OF POST TEST CRYING DURATION AMONG PRETERM INFANTS IN GROUP A (SWADDLE BATH) AND GROUP B (CONVENTIONAL BATH).

N=60

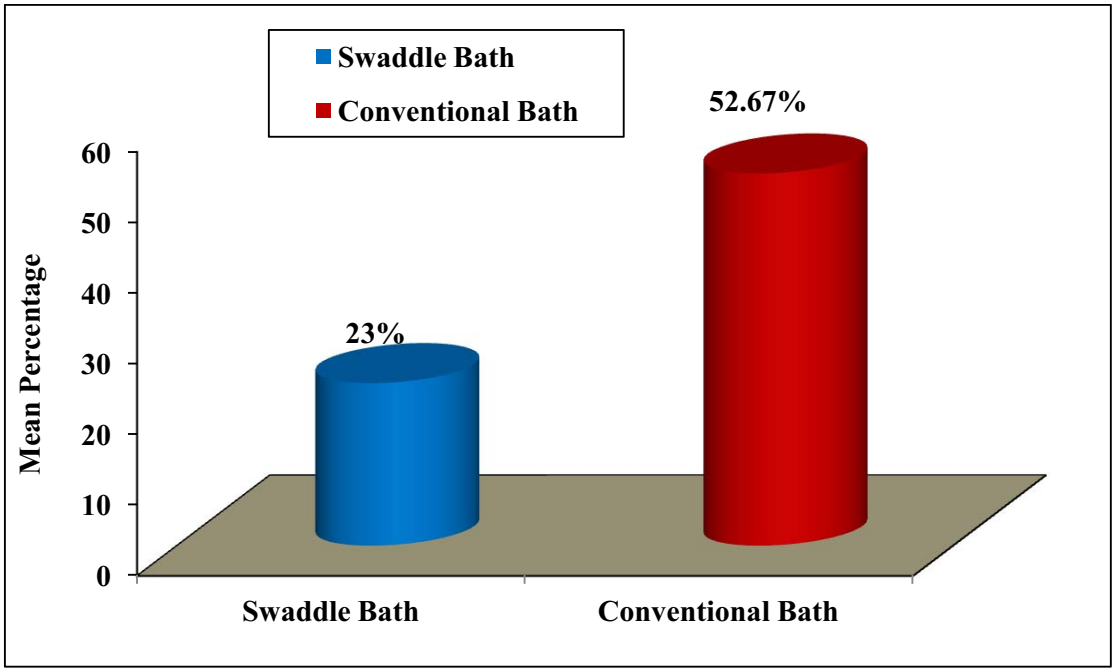


Fig.4.3.1: Mean percentage of crying duration among preterm infants between Group A and Group B

The above fig.4.3.1 describes with the mean percentage between preterm infants of swaddle bath and conventional bath, which shows that swaddle bathed preterm infants cried for very less duration as containment was provided during the bath comparatively with conventionally bathed preterm infants, where they had more crying duration with behavioural distress cues like crying, fussing, back arching, finger splaying, trunkal flaccidity, grimacing and tongue extension which lead to expenditure of large amounts of energy.

Therefore it concludes that during swaddle bath, preterm infants cried less since the bath mimics the uterine environment as they feel secure, familiar and warmth comparatively with conventional bath.

SECTION 4.4: RELATIVE EFFECTIVENESS OF LEVEL OF THERMAL STABILITY AND CRYING DURATION AMONG PRETERM INFANTS IN GROUP A (SWADDLE BATH) AND GROUP B (CONVENTIONAL BATH)

Table 4.4.1: Comparison of pretest and post test level of thermal stability among preterm infants between both group A and group B with respect to temperature and heart rate.

N = 60

S. N0	Thermal stability	Swaddle Bath (Group – A) n=30		Conventional Bath (Group - B) n=30		Mean Difference	Unpaired 't' Value	
1	**Temperature**	**MEAN**	**S.D**	**MEAN**	**S.D**		**'t'**	**P**
	Pre Test 10 minutes	36.33	0.60	36.46	0.63	-0.12	-0.78	0.435 NS
	Post test10 minutes	35.36	1.85	34.50	0.93	**0.86**	2.27	**0.02 S***
	Post Test 30 minutes	36.11	0.65	35.21	0.93	**0.90**	4.33	**0.000 S*****
2.	**Heart Rate**							
	Pre test 10 minutes	142.00	10.20	140.70	10.96	1.30	0.47	0 .636 NS
	Post test 10 minutes	140.76	21.38	177.00	16.20	**-36.23**	-7.39	**0.000 S*****
	Post test 30 minutes	132.83	17.68	166.30	20.34	**-33.46**	-6.80	**0.000 S*****

***High statistical Significance at p<0.001,**p<0.01, S–Significant, N.S – Not Significant**

The above table 4.4.1 depicts that there is no significant difference in the pretest level of thermal stability among preterm infants between group A and group B with respect to temperature and heart rate. It was proved that the mean temperature loss was less in preterm infants who underwent swaddle bath and mean temperature loss was high in conventional bath. The mean heart rate shows that preterm infants had very minute raise at 10^{th} minute after swaddle bath but maintained heart rate within normal limits by 30^{th} minute after swaddle bath whereas after conventional bath, preterm infants showed tachycardia at 10^{th} and 30^{th} minute after bath. The calculated unpaired 't' value shows there was significant difference was found between group A and group B at p<0.001 level.

N = 60

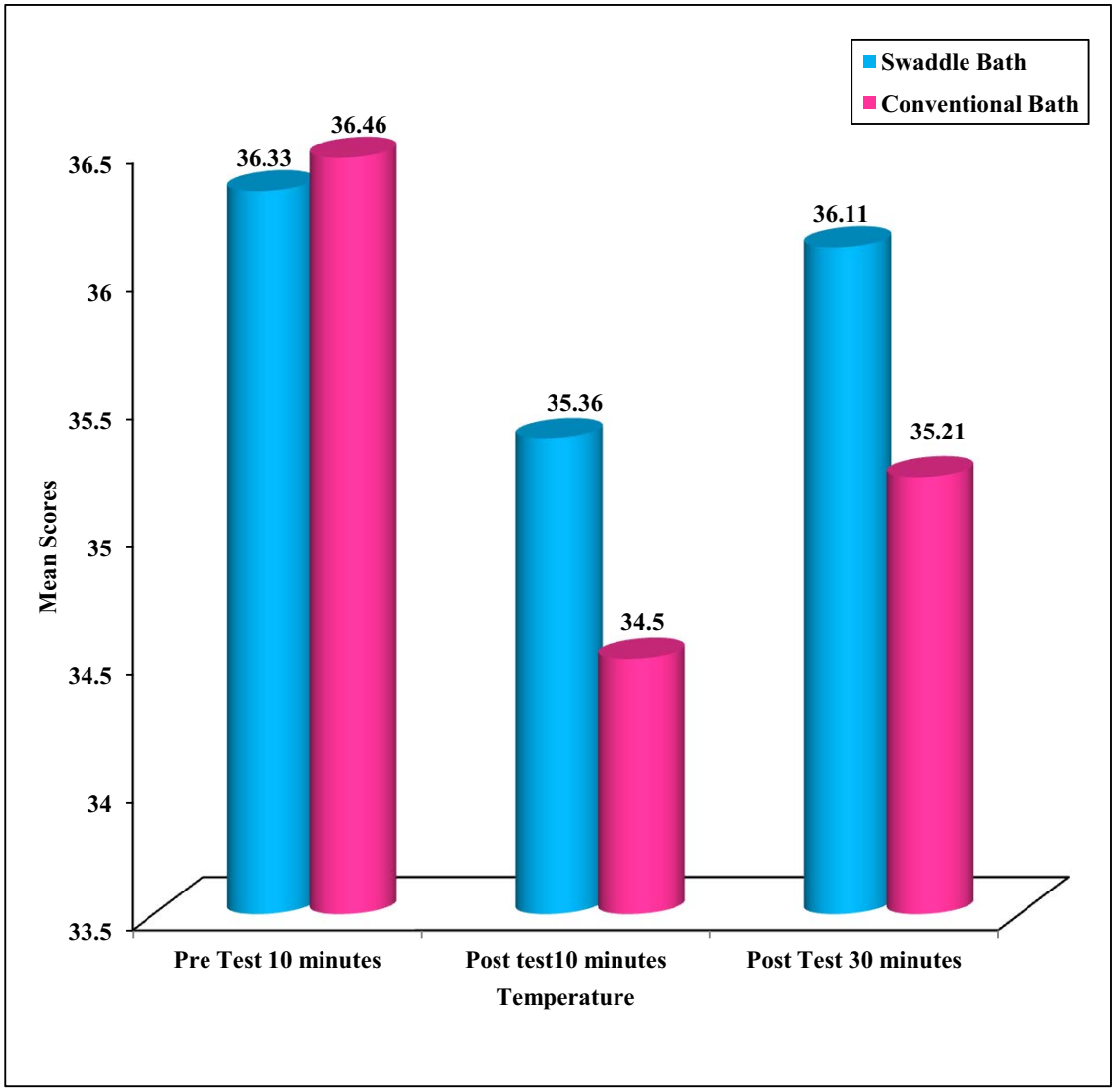


Fig.4.4.1: Comparison of pretest and post test level of thermal stability among preterm infants between both group A and group B with respect to temperature.

The figure 4.4.1 portrays that the mean temperature loss was less in preterm infants who underwent swaddle bath and mean temperature loss was high in conventional bath. The calculated unpaired 't' value shows there was significant difference was found between group A and group B at $p<0.001$ level.

Table 4.4.2: Comparison of pretest and post test level of thermal stability among preterm infants between both group A and group B with respect to respiratory rate and oxygen saturation.

N=60

S.No	Thermal stability	Swaddle Bath (Group – A) n=30		Conventional Bath (Group- B) n=30		Mean Difference	Unpaired 't' Value	
1.	**Respiratory Rate**							
	Pre test 10 minutes	43.60	5.66	45.00	5.81	-1.40	-0.94	0.349 NS
	Post test 10 minutes	45.93	5.97	65.33	7.86	**-19.40**	-10.75	**0.000 S*** **
	Post test 30 minutes	42.53	5.50	57.53	9.97	**-15.00**	-7.21	**0.000 S*** **
2.	**Oxygen Saturation**							
	Pre test 10 minutes	92.13	1.56	92.30	1.60	-0.16	-0.40	0.685 NS
	Post test 10 minutes	91.33	1.29	90.50	1.38	**0.83**	2.40	**0.019 S***
	Post test 30 minutes	91.60	1.37	91.06	1.57	0.53	1.39	0.168 NS

*****High statistical Significance at p<0.001,**p<0.01, S–Significant, N.S – Not Significant**

The above table 4.4.2 depicts that there is no significant difference in the pretest level of thermal stability among preterm infants between group A and group B with respect to respiratory rate and oxygen saturation. The mean respiratory rate shows there was maintained respiratory rate after swaddle bath both at 10^{th} and 30^{th} minute. The mean respiratory rate also shows that there is increase in respiratory rate for longer period of time both at 10^{th} and 30^{th} minute after conventional bath. The mean oxygen saturation shows that maintained oxygen saturation was found in swaddle bath and the mean oxygen saturation was slightly decreased compared with pretest in conventional bath. The calculated unpaired 't' value shows that there was significant difference was found between group A and group B at $p<0.001$ level.

Although there was significant difference found in both the groups, it was proved that with mean difference, preterm infants undergone swaddle bath had maintained thermal stability for prolonged period of time where as preterm infants undergone conventional bath had not maintained at 10^{th} minute but maintained at 30^{th} minute.

Table 4.4.3: Comparison of crying duration among preterm infants between Group A and Group B

N =60

Crying Duration	Min.	Max.	Mean	S.D	Mean difference	Unpaired 't' value
Group A (Swaddle Bath) N=30						
Duration (minutes)	0.5	2.0	1.150	0.4939		
Percentage (%)	10.0	40.0	23.000	9.878	**-1.48**	-10.92
Group B (Conventional Bath) N=30					**-29.66**	**.000*** **
Duration (minutes)	2.0	3.5	2.633	0.5561		
Percentage (%)	40.0	70.0	52.667	11.121		

*** **- High statistical Significance at p<0.001**

The table 4.3.1 reveals that preterm infants had a less cry, minimum of 30seconds to maximum of 2minutes crying time during swaddle bath in group A and minimum of 2minutes to 3minutes and 30 seconds crying time during conventional bath in group B. The calculated unpaired 't' value was found to be statistically highly significant at p<0.001 level.

Therefore it concludes that during swaddle bath, preterm infants cried very less duration due to containment offered in it comparatively with conventional bath.

SECTION 4.5: CORRELATION OF POST TEST MEAN SCORE OF THERMAL STABILITY WITH POST TEST MEAN SCORE OF CRYING DURATION AMONG PRETERM INFANTS IN GROUP A AND GROUP B.

Table 4.5.1: Correlation of post test mean score of thermal stability with post test mean score of crying duration among preterm infants in Group A

n=30

CORRELATION OF VARIABLES	POST TEST	'r' value	Level of significance
Temperature & Crying duration	Post test 10 minutes	-0.35	P= 0.053 NS
	Post test 30 minutes	-0.69	P=0.01, S**
Heart rate & Crying duration	Post test 10 minutes	-0.44	P=0.05, S*
	Post test 30 minutes	-0.21	P=0.01, S**
Respiratory rate & Crying duration	Post test 10 minutes	0.15	p = 0.412, N.S
	Post test 30 minutes	-0.19	P=0.01, S**
Oxygen saturation & Crying duration	Post test 10 minutes	0.24	p = 0.197, N.S
	Post test 30 minutes	-0.08	P=0.0, S**

****Correlation is significant(S) at 0.01level (2 tailed test)**
***Correlation is significant(S) at 0.05level (2 tailed test)**

The above table 4.5.1 depicts that the correlation between post test level of thermal stability and post test crying duration among preterm infants in group A revealed that calculated 'r' value indicated that there was negative correlation between temperature and crying duration statistically significant at $p<0.01$ level; The calculated 'r' value indicated that there was negative correlation between heart rate and crying duration which was found to be statistically significant at 10minutes after bath at $p<0.05$ level and the calculated 'r' value indicated that at 30minutes after bath statistically significant at $p<0.01$ level. The calculated 'r' value indicated that there was positive correlation between respiratory rate and crying duration at 10minutes which was not statistically significant and the calculated 'r' value indicated negative correlation at 30 minutes after bath which was found statistically significant at $p<0.01$level. The calculated 'r' value indicated there was positive correlation between oxygen saturation and crying duration at 10minutes after bath which was not statistically significant and the calculated 'r' value indicated negative correlation at 30minutes after bath which was found to be statistically significant at $p<0.01$ level.

Table 4.5.2: Correlation of post test mean score of thermal stability with post test mean score of crying duration among preterm infants in Group B

n=30

CORRELATION OF VARIABLES	POST TEST	'r' value	Level of significance
Temperature & Crying duration	Post test 10 minutes	-0.17	0.348, N.S
	Post test 30 minutes	-0.40	0.01 S**
Heart rate & Crying duration	Post test 10 minutes	0.10	0.593, N.S
	Post test 30 minutes	-0.04	0.01 S**
Respiratory rate & Crying duration	Post test 10 minutes	-0.12	0.498, N.S
	Post test 30 minutes	-0.13	0.01 S**
Oxygen saturation & Crying duration	Post test 10 minutes	0.02	0.906, N.S
	Post test 30 minutes	0.06	0.01 S**

****Correlation is significant at 0.01level (2 tailed test)**
***Correlation is significant at 0.05level (2 tailed test)**

The above table 4.5.2 depicts the correlation between post test level of thermal stability and post test crying duration among preterm infants in group B revealed that calculated 'r' value indicated that there was a negative correlation between temperature and crying duration at 10minutes after bath which was not statistically significant and the calculated 'r' value indicated negative correlation at 30minutes after bath which was found to be statistically significant at $p<0.01$ level. The calculated 'r' value indicated that there was positive correlation between heart rate and crying duration at 10minutes after bath which was not statistically significant and the calculated 'r' value indicated that there was positive correlation at 30minutes after bath which was found to be statistically significant at $p<0.01$level. The calculated 'r' value indicated there was negative correlation between respiratory rate and crying duration at 10minutes which was not statistically significant and the calculated 'r' value indicated there was negative correlation at 30minutes after bath which was found to be statistically significant at $p<0.01$ level. The calculated 'r' value indicated that there was positive correlation between oxygen saturation and crying duration which was not statistically significant and the calculated 'r' value indicated there was positive correlation at 30minutes after bath which was found to be statistically high significant at $p<0.01$ level.

SECTION 4.6: ASSOCIATION OF SELECTED DEMOGRAPHIC VARIABLES WITH THE MEAN SCORE OF THERMAL STABILITY AND CRYING DURATION AMONG PRETERM INFANTS IN GROUP A AND GROUP B

Table 4.6.1 Association of selected demographic variables with mean score of thermal stability among preterm infants in group A (swaddle bath) with respect to temperature (One way ANOVA)

n=30

S. No	DEMOGRAPHIC VARIABLES	Pre test 10minutes		Post test 10minutes		Post test 30 minutes	
		Mean	'F' value Sig.	Mean	'F' value Sig.	Mean	'F' value Sig.
1.	**Mode of delivery**						
	Normal vaginal delivery	36.55		35.46	0.212 0.649	36.38	**19.279 0.000****
	Caesarean delivery	35.82		35.12		35.48	
	Others	-		-		-	
2.	**Post natal age**						
	1wk(7days)	37.00	2.932 0.052	36.00	0.394 0.759	36.50	**3.123 0.043***
	2wk(8-14days)	35.86		35.35		35.60	
	3wk(15-21days)	36.32		35.09		36.09	
	4wk(22-30days)	36.73		36.03		36.61	
3.	**Gender**		**7.970 0.009****		4.039 0.054		**12.256 0.002****
	Male	36.03		34.67		35.73	
	Female	36.60		35.96		36.44	
4.	**Birth weight in grams**						
	1500-1700	36.39	**3.026 0.047***	35.09	.248 0.862	36.20	1.513 0.235
	1701-1900	36.21		35.52		36.07	
	1901-2100	-		-		-	
	2101-2300	37.13		36.10		36.63	
	2301-2500	-		-		-	
	>2500	-		-		-	
	<1500	36.01		35.38		35.75	
5.	**Type of feed**						
	Expressed breast feed	36.56	**3.668 0.039***	35.96	1.686 0.204	36.40	**7.285 0.003****
	Formula feed	36.26		34.69		36.06	
	Combined	35.80		34.90		35.34	

The above table 4.6.1 shows that the calculated 'F' value indicated there was significant association of mode of delivery, post natal age, gender, birth weight and type of feed with the temperature among preterm infants in group A (Swaddle bath).

Table 4.6.2 Association of selected demographic variables with the mean score of thermal stability among preterm infants in group A (Swaddle bath) with respect to Respiratory rate

n=30

S. No.	DEMOGRAPHIC VARIABLE	Pretest 10minutes		Post test 10 minutes		Post test 30 minutes	
		Mean	'F' Value Sig.	Mean	'F' Value Sig.	Mean	'F' Value Sig.
1.	**Type of feed**						
	Expressed breast feed	42.80	1.552 0.230	43.60	**3.937 0.032***	42.80	0.242 0.787
	Formula feed	46.00		49.80		41.60	
	Combined	41.20		45.20		43.60	

The above table 4.6.2 shows that the calculated 'F' value indicated that there was significant association of type of feed with respiratory rate among preterm infants in group A (Swaddle bath).

n=30

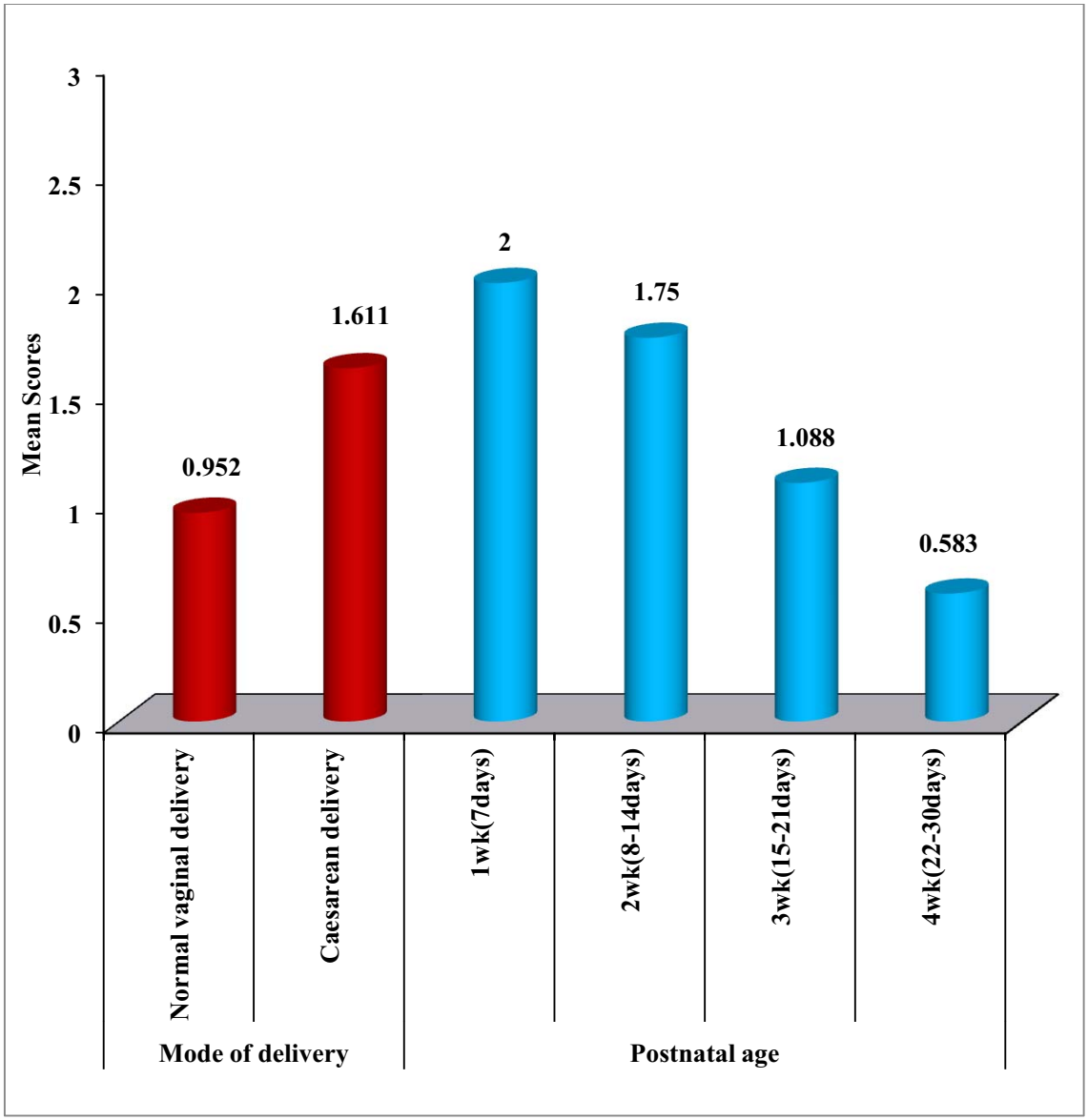


Fig.4.6.1: Association of selected demographic variables with mean score of crying duration among preterm infants in group A (Swaddle bath) (One way ANOVA)

The above Fig. 4.6.1 shows that there was significant association of mode of delivery and postnatal age with crying duration among preterm infants undergone swaddle bath in group A.

n=30

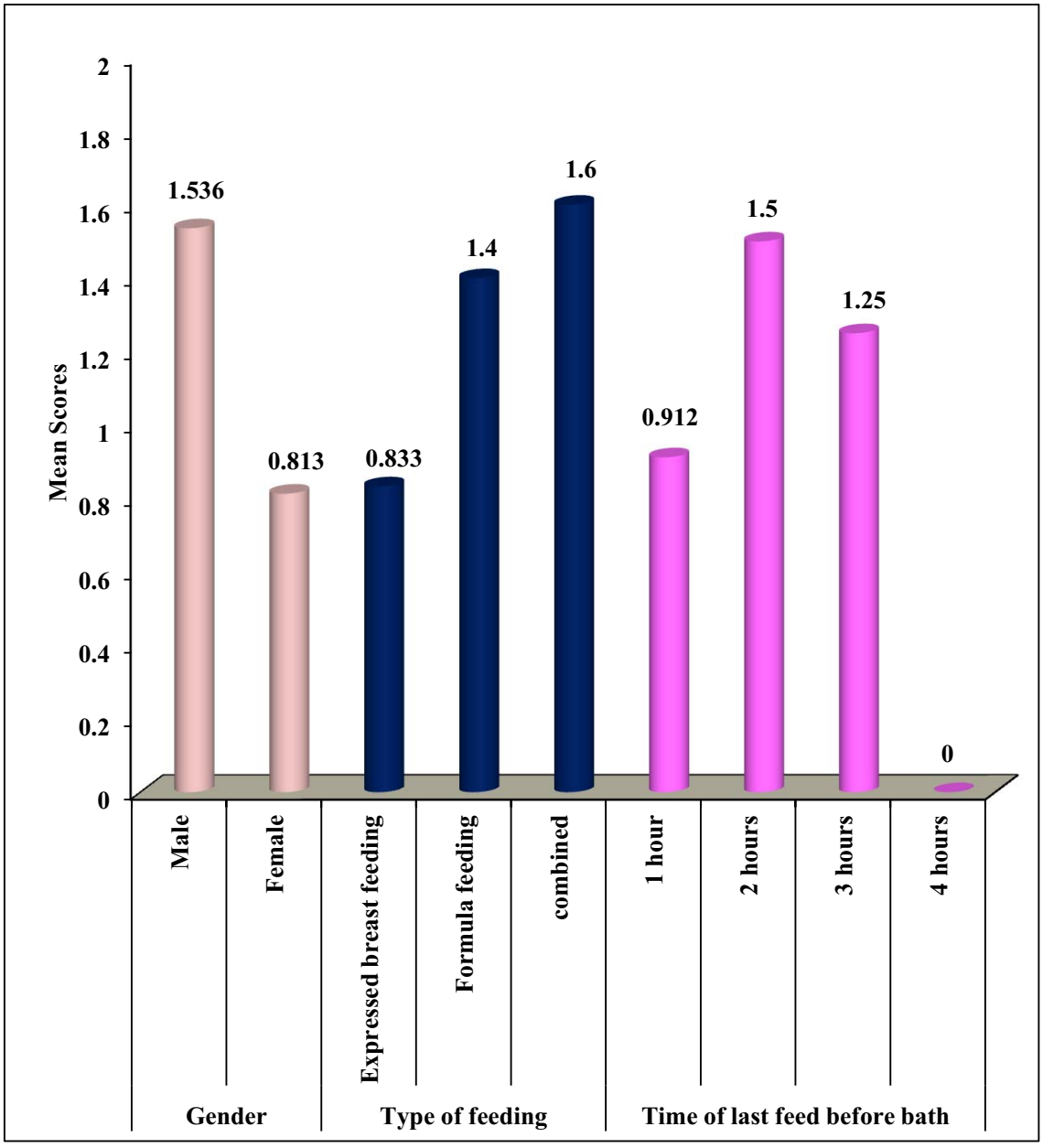


Fig.4.6.2: Association of selected demographic variables with mean score of crying duration among preterm infants in Group A (Swaddle Bath) (One way ANOVA).

The above fig.4.6.2 shows that there was significant association of gender, type of feed and time of last feed before bath with crying duration among preterm infants undergone swaddle bath in group A

Table 4.6.3. Association of selected demographic variables with the mean score of thermal stability among preterm infants in group B (Conventional bath) with respect to temperature (One way ANOVA)

n=30

S.No.	DEMOGRAPHIC VARIABLES	Pre test 10minutes		Post test 10minutes		Post test 30minutes	
		Mean	**'F' Value Sig.**	**Mean**	**'F' Value Sig.**	**Mean**	**'F' Value Sig.**
1.	**Mode of delivery**						
	Normal vaginal delivery	36.57	1.048 0.315	34.63	0.704 0.408	35.55	5.161 **0.031***
	Caesarean delivery	36.33		34.35		34.82	
	Others	**-**		**-**		**-**	
2.	**Time of last feed before bath**						
	1hour	36.70	0.825	35.22	**8.402**	35.22	0.242
	2hours	36.51	0.492	34.70	**.000*****	35.13	0.866
	3hours	36.25		33.57		35.21	
	4hours	36.00		35.20		36.00	

The above table 4.6.3 shows that there was significant association of mode of delivery and time of last feed before bath with temperature among preterm infants undergone conventional bath in group B.

Table 4.6.4: Association of selected demographic variables with the mean score of thermal stability among preterm infants in group B (Conventional Bath) with respect to heart rate.

n=30

S. No.	DEMOGRAPHIC VARIABLE	Pre test 10 minutes		Post test 10 minutes		Post test 30 minutes	
		Mean	**'F' Value Sig.**	**Mean**	**'F' Value Sig.**	**Mean**	**'F' Value Sig.**
1.	**Mode of delivery**						
	Normal vaginal delivery	141.81	0.345 0.562	167.50	**19.144 0.000*** **	157.43	**8.096 .008** **
	Caesarean delivery	139.42		187.85		176.42	
	Others	-		-		-	

The above table 4.6.4 shows that there was significant association of mode of delivery with heart rate among preterm infants in group B (Conventional bath).

Table 4.6.5. Association of selected demographic variables with the mean score of thermal stability among preterm infants in group B (Conventional bath) with respect to respiratory rate.

n=30

S.No.	DEMOGRAPHIC VARIABLES	Pre test 10minutes		Post test 10minutes		Post test 30minutes	
		Mean	'F' Value Sig.	Mean	'F' Value Sig.	Mean	'F' Value Sig.
1.	**Post natal age**						
	1wk(7days)	47.33	**5.673**	64.66	2.329	56.33	**6.196**
	2wk(8-14days)	47.14	**0.009****	68.28	.117	63.00	**0.006****
	3wk(15-21days)	40.60		61.60		50.60	
	4wk(22-30days)	-		-		-	
2.	**Frequency of feeds in a day**						
	1hourly	41.50	2.942	59.00	2.379	45.50	**4.394**
	2hourly	44.11	0.070	65.11	0.112	58.55	**0.022***
	3hourly	-		-		-	
	on demand	48.75		69.00		61.25	

The above table 4.6.5 shows that there was significant association of postnatal age and frequency of feeds in a day with respiratory rate among preterm infants in group B (conventional bath).

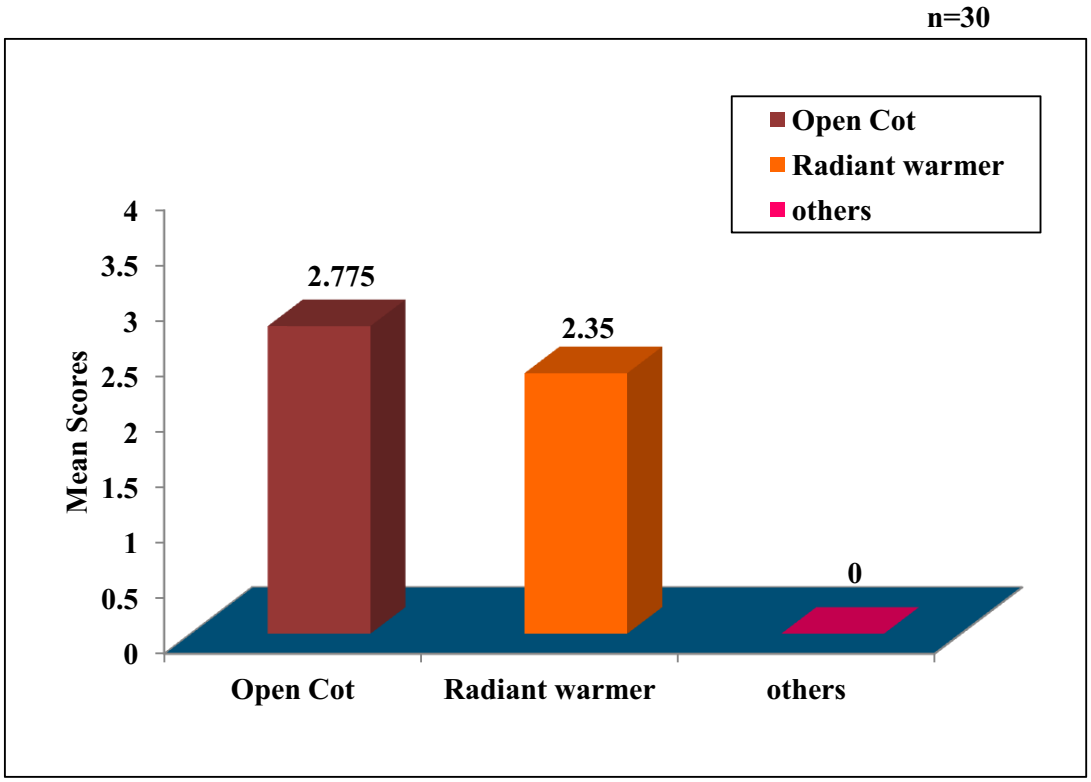


Fig. 4.6.3: Association of selected demographic variables with mean score of crying duration among preterm infants in Group B (Conventional bath) (One way ANOVA).

The above fig 4.6.3 shows that there was significant association of place of preterm infant preterm infants before bath with crying duration among preterm infants in group B (conventional bath).

CHAPTER – 5

DISCUSSION

DISCUSSION

This chapter discusses in detail the findings of the study derived from the statistical analysis in pertinence to the objectives of the study and further discussion will exemplify the fulfillment of the objectives by the study findings. The purpose of the study was to assess the relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration.

As per the stated objectives the findings of the study were discussed.

5.1 Description of demographic variables among preterm infants in group A and group B

The demographic variables of both group A and group B as shown in table 4.1.1 to 4.1.3 depicts that homogeneity of the group was maintained for three demographic variables such as gestational age, gender and place of preterm infants before bath as they were pair matched.

The table 4.1.1 to 4.1.3 study findings depicts that on assessment of demographic variables the majority of preterm infants belongs to 34 weeks of gestation and were born by normal vaginal delivery and most of the preterm infants were predominantly females and had birth weight between 1500-1700gms with postnatal age of 15-21days (3weeks) and had APGAR score between 5 and 7 at 5^{th} minute of birth. All most all were on expressed breast feeding every 2 hourly. Majority of them were from open cot and weighed between 1901-2100gms before swaddle bath and were fed 1hour prior to swaddle bath in group A.

The table 4.1.1 to 4.1.3 study findings depicts that on assessment of demographic variables the majority of preterm infants belongs to 34weeks of gestation and were born by normal vaginal delivery and most of the preterm infants were females and had birth weight between 1701-1900gms with postnatal age of 8-14days (2weeks) and had APGAR score greater than 7 at 5^{th} minute of birth. All most all were on expressed breast feeding every 2hourly. Majority of them were from open cot and weighed between 1701-

1900gms before conventional bath and were fed 2 hours prior to conventional bath in group B.

5.2 The first objective of the study was to assess and compare the pre and post test level of thermal stability among preterm infants in both group A and group B.

The fig.4.2.1 study findings depicts that, the pretest analysis presents that on assessment of level of thermal stability which consisted of four parameters i.e., temperature, heart rate, respiratory rate and oxygen saturation among preterm infants in group A. The mean temperature 36.33 at 10minutes before swaddle bath shows that preterm infants were in a state of mild hypothermia and mean temperature 35.36 at 10 minutes after bath shows that preterm infants were in a state of mild hypothermia and mean temperature 36.11 at 30 minutes after bath shows that preterm infants were still in a state of mild hypothermia which shows the temperature of the preterm infants was maintained. The mean heart rate 142.00 at 10 minutes before bath shows that the preterm infants had normal heart rate and mean heart rate 140.76 at 10 minutes after bath shows preterm infants had normal heart rate and mean heart rate 132.88 at 30minutes after bath shows preterm infants had normal heart rate which shows that preterm infants had maintained heart rate before and after swaddle bath. The mean respiratory rate 43.66 at 10 minutes before bath shows that preterm infants had normal respiratory rate and mean respiratory rate 45.99 at 10 minutes after bath shows that preterm infants had maintained normal respiratory rate and the mean respiratory rate 42.55 at 30 minutes after bath shows that preterm infant had normal respiratory rate which indicates preterm infants had maintained respiratory rate before and after swaddle bath. The mean oxygen saturation 92.13 at 10 minutes before bath shows that preterm infants had normal oxygen saturation and at mean oxygen saturation 91.33 at 10 minutes after bath shows that preterm infants undergone mild de saturation and mean oxygen saturation 91.60 at 30minutes after bath shows that preterm infants maintained saturation levels before and after swaddle bath.

The fig. 4.2.2 study findings depicts that the pretest analysis on assessment of level of thermal stability which consisted of four parameters i.e., temperature, heart rate, respiratory rate and oxygen saturation among preterm infants in group B. The mean temperature 36.46 at 10 minutes before conventional bath shows that preterm infants were in a state of mild hypothermia and mean temperature 34.50 at 10 minutes after bath

shows that preterm infants were in a state of moderate hypothermia and mean temperature 35.21 at 30 minutes after bath shows that preterm infants were in a state of mild hypothermia which indicates that preterm infants had alterations in temperature and could not maintain optimal temperature. The mean heart rate 140.70 at 10 minutes before bath shows that the preterm infants had normal heart rate and mean heart rate 177.00 at 10 minutes after bath shows preterm infants had increased heart rate called tachycardia and mean heart rate 166.30 at 30 minutes after conventional bath shows preterm infants heart rate was at borderline to tachycardia which indicates that preterm infants had alterations in heart rate. The mean respiratory rate 45.00 at 10 minutes before bath shows that preterm infants had normal respiratory rate and mean respiratory rate 65.33 at 10 minutes after conventional bath shows that preterm infants had increased respiratory rate called tachypnoea and the mean respiratory rate 57.50 at 30 minutes after bath shows that preterm infants respiratory rate was at borderline to tachypnoea which indicates that preterm infants had alterations in respiratory rate. The mean oxygen saturation 92.30 at 10 minutes before bath shows that preterm infants had normal oxygen saturation and mean oxygen saturation 90.50 at 10 minutes after bath shows that preterm infants undergone mild de saturation and mean oxygen saturation 91.06 at 30 minutes after bath shows that preterm infants had regained saturation levels.

5.2 The second objective of the study was to assess the post test crying duration among preterm infants in group A and group B.

The fig.4.3.1 study findings depicts that on assessment of crying duration, preterm infants had a minimum cry of 30seconds (10%) to maximum of 2minutes (40%) during swaddle bath in group A.

The study findings depicts that on assessment of crying duration, preterm infants had minimum cry of 2 minutes (40%) to 3minutes and 30seconds(70%) during conventional bath in group B.

The results were supported by a study Peters K.L (2012) suggests that swaddle bathed preterm infants recognized to have improved physiological stability of their parameters and thereby reduced behavioural distress signs like crying and fussing, which assumed to be a concern during conventional bath. The findings were also supported by

Mitra Edraki, et al., (2014) as she found that preterm infants underwent swaddle bath cried very less period of time than the preterm infants underwent conventional bath.

5.3 The third objective of the study was to assess the relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants.

There was no significant difference in the level of temperature between group A and group B in the pre test 10 minutes. The calculated 't' value was 2.270 in the post test 10 minutes which revealed that there was significant difference in the level of temperature between group A and group B at $p<0.05$ level. The calculated 't' value was 4.336 in the post test 30 minutes which revealed that there was significant difference in the level of temperature between group A and group B at $p<0.001$ level.

There was no significant difference in the level of heart rate between group A and group B in the pre test 10 minutes. The calculated 't' value was -7.396 in the post test 10 minutes which revealed that there was significant difference in the level of heart rate between group A and group B at $p<0.001$ level. The calculated 't' value was -33.4667 in the post test 30 minutes which revealed that there was significant difference in the level of heart rate between group A and group B at $p<0.001$ level.

There was no significant difference in the level of respiratory rate between group A and group B in the pre test 10 minutes. The calculated 't' value was -10.75 in the post test 10 minutes which revealed that there was significant difference in the level of respiratory rate between group A and group B at $p<0.001$ level. The calculated 't' value was -7.211 in the post test 30 minutes which revealed that there was significant difference in the level of respiratory rate between group A and group B at $p<0.001$ level.

There was no significant difference in the level of oxygen saturation between group A and group B in the pre test 10 minutes. The calculated 't' value was 2.408 in the post test 10 minutes which revealed that there was significant difference in the level of oxygen saturation between group A and group B at $p<0.05$ level. The calculated 't' value was 1.396 in the post test 30 minutes which revealed that there was no significant difference in the level of oxygen saturation between group A and group B.

The calculated unpaired 't' value was -10.92 which indicated that there was a high level of statistical significant difference in the post test crying duration among preterm infants between the group A and group B at $p<0.001$ level.

The above inference concludes that although there was significant difference found in both the groups, it was proved that the mean temperature loss was less among preterm infants with 0.9^0 C at 10^{th} minute and 0.2^0C at 30^{th} minute after swaddle bath and mean temperature loss was high among preterm infants with 2.0^0 C at 10^{th} minute and 1.3^0C at 30^{th} minute after conventional bath. The heart rate, respiratory rate and oxygen saturation were maintained at 10^{th} minute and 30^{th} minute after swaddle bath, where as the heart rate and respiratory was increased to tachycardia and tachypnoea at 10^{th} and 30^{th} minute respectively after conventional bath. The oxygen saturation was reduced from 92% to 91% at 10^{th} minute and maintained to 91% at 30^{th} minute after swaddle bath, where as the oxygen saturation was reduced from 92% to 90% at 10^{th} minute and maintained to 91% at 30^{th} minute. Hence preterm infants undergone swaddle bath had maintained thermal stability at 10^{th} and 30^{th} minute after swaddle bath, where as preterm infants undergone conventional bath were not maintained thermal stability at 10^{th} minute but regained at 30^{th} minute after conventional bath.

The findings were supported by Mitra edraki, et al., (2014) who conducted a randomized control trial using random allocation and divided 50 preterm infants in to two groups (25 in swaddle bath and 25 in conventional bath) and assessed the thermal stabilitty and crying duration among preterm infants. The results indicated that the mean temperature loss was significantly less in preterm infants who were given swaddle bath than the preterm infants who were given conventional bath. The study also supports the findings for crying duration as they found that crying time was significantly less among swaddle bathed preterm infants than conventionally bathed preterm infants.

Bryanton (2014) compares the diverse effects of tub and sponge bath on body temperature among the preterm infants and the results found that the preterm infant's heat loss in less in tub bath method than in sponge bath method at $P<0.001$level. The results contributes that during the tub bathing as the preterm or term infants being immersed in the warm water is just like being immersed in amniotic fluid in- utero environment

which comforts the newborns. A research Study findings shows that swaddling technique helps to reduce pain in newborns (Quraishy K, et al., (2013). Swaddling is an effective technique in decreasing the preterm infants behavioural distress (Neu M & Browne JV, 2011). Another study (Bowles SM et al. 2013) says that providing containment to the newborn during the bathing process can reduce stress levels. In the swaddle bathing mthod, immersion into water which mimics the uterine environment and containment stimulates the familiar and secure feeling and promotes a calm and stress free bathing experience for the newborns (Hall K, 2010).

A research study (Fern et al. 2014) found the advantage of swaddle bathing method and stated as improved state control, i.e. decreased crying and agitation was gained in newborns who were swaddled. Liaw et al. (2013) aimed to determine the effect of nurse's care giving behaviours on preterm infant behavioural responses during the bath reported that infants whose caregivers provided them with more supportive and familiar behaviours during the bath especially such as position support and containment showed less stress and more self regulatory behaviours.

The conceptual framework adopted for this study was **Mefford's theory of health promotion for preterm infants** derived from Levine's conservation model, which supported this study and was helpful for the investigator to accomplish the study in an integrated approach. The investigator identified the felt need of preterm infants by assessing the pre test level of thermal stability using WHO guidelines and promoted wholeness by using principles of conservation. In the wholeness of preterm infant the investigator assessed the post test level of thermal stability using WHO guidelines and crying duration was assessed by using video recordings and interpreted with crying percentage formula and directed the sample for reinforcement.

Thus the null hypothesis NH_1 stated earlier that **"There is no significant difference in relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants at P< 0.05 level was rejected."**

5.4 The fourth objective was to correlate the post test mean score of thermal stability with post test mean score of crying duration among preterm infants in group A and group B.

The table 4.5.1 study findings depicts that correlation between post test level of thermal stability and post test crying duration among preterm infants in group A revealed that calculated 'r' value -0.698 indicated that there was negative correlation between temperature and crying duration which was found to be statistically significant at $p<0.01$ level; The calculated 'r' value -0.447 indicated that there was negative correlation between heart rate and crying duration which was found to be statistically significant at 10minutes after bath at $p<0.05$level and 'r' value -0.218 at 30minutes after bath statistically significant at $p<0.01$ level. The calculated 'r' value 0.155 indicated that there was positive correlation between respiratory rate and crying duration at 10minutes which was not statistically significant and the calculated 'r' value -0.195 indicated negative correlation at 30minutes after bath which was found statistically significant at $p<0.01$level. The calculated 'r' value 0.243 indicated there was positive correlation between oxygen saturation and crying duration at 10minutes after bath which was not statistically significant and the calculated 'r' value -0.086 indicated negative correlation at 30minutes after bath which was found to be statistically significant at $p<0.01$ level.

The above inference shows that when the crying duration during the swaddle bath was high, there were alterations in the physiological parameters. The relationship between the thermal stability and crying duration found that as crying duration increases, temperature and oxygen saturation decreases, heart rate and respiratory rate increases.

The table 4.5.2 study findings depicts that correlation between post test level of thermal stability and post test crying duration among preterm infants in group B revealed that calculated 'r' value -0.177 indicated that there was a negative correlation between temperature and crying duration at 10minutes after bath which was not statistically significant and the calculated 'r' value -0.406 indicated negative correlation at 30minutes after bath which was found to be statistically significant at $p<0.01$ level. The calculated 'r' value 0.101 indicated that there was positive correlation between heart rate and crying duration at 10minutes after bath which was not statistically significant and the calculated 'r' value 0.101 indicated that there was positive correlation at 30minutes after bath which was found to be statistically significant at $p<0.01$level. The calculated

'r' value -0.129 indicated there was negative correlation between respiratory rate and crying duration at 10minutes which was not statistically significant and the calculated 'r' value -0.129 indicated there was negative correlation at 30minutes after bath which was found to be statistically significant at $p<0.01$ level. The calculated 'r' value 0.022 indicated that there was positive correlation between oxygen saturation and crying duration which was not statistically significant and the calculated 'r' value 0.068 indicated there was positive correlation at 30minutes after bath which was found to be statistically high significant at $p<0.01$ level.

The above inference concludes that when the crying duration during the conventional bath is high, there will be alterations in the physiological parameters. The relationship between the thermal stability and crying duration found that as crying duration increases, temperature and oxygen saturation decreases, heart rate and respiratory rate increases.

Thus the null hypothesis NH_2 stated earlier that **"There is no significant correlation of post test mean score of thermal stability with post test mean score of crying duration among preterm infants in group A and group B at P< 0.05 level was rejected.**

5.5 The fifth objective was to associate the selected demographic variables with the mean score of thermal stability and mean score of crying duration among preterm infants in group A and group B.

The study findings were analyzed using one way analysis of variance for association of selected demographic variables with the mean score of thermal stability and mean score of crying duration.

The table 4.6.1 study findings depicts that calculated 'F' value indicated that there was significant association with the demographic variables such as mode of delivery, postnatal age, gender, birth weight and type of feed with temperature among preterm infants undergone swaddle bath in group A at $p<0.05$ level.

With regard to mode of delivery, during caesarean delivery due to anaesthesia given to mother, it affects the immature central nervous system of preterm infant and

slows down the thermoregulation process performed by immature hypothalamus and thus posed to significant minute temperature loss at 10minutes after swaddle bath but still maintained temperature at 10minutes before swaddle bath and at 30th minute after swaddle bath among preterm infants and during normal delivery the preterm infants had maintained temperature at 10minutes before bath but minute reduction was found at 10minutes after swaddle bath and maintained again at 30minute after swaddle bath due to containment offered during entire swaddle bath as preterm infants were kept in flexed midline position and were swaddled with autoclaved thick soft towel which protects from heat loss by conserving energy.

With regard to the post natal age, preterm infants belongs to 3weeks (15-21days) and 4weeks (22-30days) of postnatal age had significant influence on temperature because it was theoretically proved that as the age of the preterm infant increases the structural immaturity of central nervous system also improves. Therefore hypothalamus functions better to maintain thermoregulation and hence maintained temperature at 30th minute after swaddle bath.

With regard to the gender, preterm infants who were females had maintained temperature at 10minutes before swaddle bath and at 30th minute after swaddle bath as it has impact on maintaining thermoregulation.

With regard to the birth weight, preterm infants weighed between 2101-2300grams had maintained temperature at 10minutes before swaddle bath which influences the thermal stability of preterm infant where the body muscle mass is high they develop their ability to maintain thermoregulation.

With regard to type of feed, preterm infants who were received expressed breast feed had maintained temperature at 10 minutes before swaddle bath and at 30th minute after swaddle bath because it was theoretically proved that breast feed helps to maintain thermoregulation.

The table 4.6.2 study findings depicts that calculated 'F' value indicated that there was significant association of demographic variable type of feed with respiratory rate among preterm infants in group A(Swaddle bath) at $p<0.05$ level because of

scientific reason that breast feed protects preterm infant and all neonates against respiratory infections. Thus protected preterm infant from tachypnoea at 10^{th} minute after swaddle bath as familiar containment was offered during swaddle bath.

The fig.4.6.3 to 4.6.4 study findings depicts that the calculated 'F' value indicated that there was significant association with the demographic variables such as mode of delivery, post natal age, gender, type of feed and time of last feed before bath with crying duration among preterm infants in group A (swaddle bath) at $p<0.05$ level.

With regard to the mode of delivery, preterm infants who were born by caesarean delivery had cried very less period of time than other preterm infants during swaddle bath in group A.

With regard to the postnatal age, preterm infant belongs to 1week (7days) of postnatal age had cried very less period of time than other preterm infants due to immaturity during swaddle bath in group A

With regard to the gender, preterm infants who were males had cried very less period of time than other preterm infants during swaddle bath as the containment was provided during entire bath in group A.

With regard to the type of feed, preterm infants who were received combined feed (expressed breast feed and formula feed) had cried very less period of time during swaddle bath as the containment was provided during entire bath in group A.

With regard to the time of last feed before bath, preterm infants who received feed 2hours before bath had cried very less period of time during swaddle bath as the containment was provided during entire bath in group A.

The table 4.6.3 study findings depicts that calculated 'F' value indicated that that there was significant association with the demographic variables mode of delivery and time of last feed before bath with temperature among preterm infants in group B (conventional bath) at $p<0.05$ level.

With regard to the mode of delivery, preterm infants who were born by caesarean delivery were not maintained temperature at 30th minute after conventional bath because during caesarean delivery due to anaesthesia given to mother, it affects the immature central nervous system of preterm infant and slows down the thermoregulation process performed by immature hypothalamus and thus posed to significant minute temperature loss at 10minutes after conventional bath.

With regard to the time of last feed before bath, preterm infants who were received feed 2hours before bath had maintained temperature at 10th minute after conventional bath because the feed taken by preterm infant helps to conserve the energy during bath.

The table 4.6.4 study findings depicts that calculated 'F' value indicated that there was significant association of demographic variables gestational age and mode of delivery with heart rate among preterm infants in group B (conventional bath) at $p<0.05$ level.

With regard to the gestational age, preterm infants who were born between 34 to 36 weeks of gestation had maintained heart rate at 30th minute after conventional bath because of the reason with reference to many studies; it was found there was significant association was found between the heart rate and gestational age. As the gestational age reaches near to term, the heart develops its ability to maintain to its rate and rhythm.

With regard to the mode of delivery, preterm infants who were born by normal vaginal delivery had maintained heart rate at 30th minute after conventional bath among preterm infants in group B (conventional bath).

The table 4.6.5 study findings depicts that calculated 'F' value indicated that there was significant association of demographic variables postnatal age and frequency of feeds in a day with respiratory rate among preterm infants in group B (conventional bath) at $p<0.05$ level.

With regard to postnatal age, preterm infants belongs to 3week(15-21days) had maintained respiratory rate 10 minutes before conventional bath and at 30th minute after

conventional bath because as age increases the structural immaturity of respiratory system also increases which has impact to maintain optimum respiratory rate.

With regard to frequency of feeds in a day, preterm infants who were received feeds every 1hourly had maintained temperature at 30^{th} minute after conventional bath among preterm infants in group B (conventional bath).

The fig 4.6.3 study findings depicts that calculated 'F' value indicated that there was significant association of demographic variable place of preterm infant before bath with crying duration among preterm infants in group B (conventional bath) at $p<0.05$ level because preterm infants who were lying in open cot before bath had cried longer duration during conventional bath as there were nakedly exposed to environment and given bath with wet wipes.

The other demographic variables had not shown statistically significant association with the mean score of thermal stability and post test mean score of crying duration among preterm infants in group A (swaddle bath) and group B (conventional bath).

Hence the null hypothesis $\mathbf{NH_3}$ stated earlier "**There is no significant association of selected demographic variables with the mean core of thermal stability and mean score of crying duration among preterm infants in group A and group B at P< 0.05 level" was rejected** for the demographic variables namely mode of delivery, post natal age, gender, birth weight, type of feed for thermal stability and mode of delivery, postnatal age, gender, type of feed and time of last feed before bath for crying duration in group A. Time of last feed, mode of delivery, gestational age, post natal age and frequency of feeds in a day for thermal stability and place of preterm infant before bath for crying duration in group B. It was **accepted** for other demographic variables for thermal stability and crying duration in both group A and group B.

Based on these results, the investigator recommends that nurses can effectively carry out Swaddle bath to maintain thermal stability and reduce crying duration among preterm infants. Accordingly, mother and their family members will be trained in this regard. It is noteworthy that one of the main objectives of nursing care is to provide preterm infants a stress free and familiar experience during hospitalization.

CHAPTER – 6

SUMMARY, CONCLUSION, IMPLICATIONS, RECOMMENDATIONS AND LIMITATIONS

SUMMARY, CONCLUSION, IMPLICATIONS, RECOMMENDATIONS AND LIMITATIONS

This chapter presents the summary, conclusion, implications, recommendations and limitations of the study based on objectives selected

6.1 SUMMARY

India has the highest number of deaths due to premature birth and prematurity accounts for largest number of admissions especially in families with low socio economic status. Due to unaffordability of many families towards the new advancements and costly equipments towards maintaining the health of preterm infant with regard to thermal stability and also lack of knowledge regarding preterm infant containment in order to reduce crying duration during the entire bath procedure. Though there are various measures like radiant warmer to protect preterm infant from hypothermia, it is very important for nurses to maintain thermal stability of preterm infant even out of radiant warmer during nursing procedures like bathing. Though there were various types of conventional bath like tub bath, sponge bath and lap bath, easy bath with their own benefits but increases crying duration and causes behavioural distress during bath, in the current scenario the conventional bath given for all the preterm infants was easy bath with wet wipes which saves nurses time in various hospitals. Therefore the investigator brought the concept swaddle bath which is inexpensive, safe, secure and provides containment during the entire bath. Hence to protect preterm infants both physically and psychologically the investigator compared swaddle bath with conventional bath in order to maintain the thermal stability and reduce crying duration which acts as precursor to protect preterm infants from hypothermia. Thus a true experimental comparative study was conducted to assess the relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants at selected hospital, Surat. The findings signified that swaddle bath was comparatively effective in maintaining thermal stability for a prolonged period of time and reducing crying time during bath where as in conventional bath, preterm infants were maintaining thermal stability for a very short period of time and could not reduce crying duration.

The objectives of the study were

1. To assess and compare the pre and post test level of thermal stability among preterm infants in group A and group B.
2. To assess the post test level of crying duration among preterm infants in group A and group B.
3. To assess the relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants
4. To correlate the post test mean score of thermal stability with post test mean score of crying duration among preterm infants in group A and group B.
5. To associate the selected demographic variables with the mean score of thermal stability and mean score of crying duration among preterm infants in group A and group B

The null hypothesis formulated were

NH_1: There is no significant difference in relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants at $P< 0.05$ level.

NH_2: There is no significant correlation on mean score of thermal stability with mean score of crying duration among preterm infants in group A and group B at $P< 0.05$ level.

NH_3: There is no significant association of selected demographic variables with the mean score of thermal stability and mean score of crying duration among preterm infants in group A and group B at $P< 0.05$ level

The review of literature was collected from various primary and secondary sources, along with personal and professional experience and expert's opinion from the field of child health nursing that provided a comprehensive framework for the selection of problem and for accomplishing the objectives of the study. It also strengthened the ideas for framing the conceptual framework, aided to design the methodology and for the development of the tool for data collection.

The conceptual framework for the study was based on Mefford's Theory of health promotion for preterm infants.

The researcher adopted quantitative research approach and the true experimental comparative research design was used to assess the relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants. The research study was conducted among the preterm infants who fulfilled the inclusive criteria at NICU of Anand Hospital during the period of data collection. The sample size was 60 preterm infants who were categorized using simple random sampling technique through lottery method and the samples were assigned as 30 in group A and 30 group B.

The tool constructed in this study had 2parts (Data collection tool and intervention tool). Data collection tool had 3 sections; **Section A : Demographic data** to collect details on gestational age, mode of delivery, postnatal age of preterm infant, APGAR score at 5^{th}min, gender, birth weight, weight before bath, type of feeding, frequency of feeds in a day, time of last feed before bath, place of preterm infant before bath. **Section B: W.H.O guidelines to assess thermal stability** which consists of temperature, heart rate, respiratory rate and oxygen saturation. **Section C: Crying percentage formula to assess crying duration.** The intervention tool had 2sections; **Section A :** Swaddle bath for group A and **Section B :** Conventional bath for group B.

The tool was validated by the medical and nursing experts. Pilot study was conducted at Raja Sir Ramaswamy Mudaliar Hospital (RSRM), Chennai and results proved to be practicable and feasible to proceed with the main study. The reliability of the tool was established by inter – rater method or inter observer method by using Karl Pearson Correlation Coefficient method by which the reliability obtained was ‘r = 0.9. The findings indicated that the tool was highly reliable to proceed with the main study.

The ethical aspect of research was maintained throughout the study by obtaining ethical clearance certificate from ICCR, formal permission from the perspective authorities and parental assent. Confidentiality of privacy was maintained throughout the data collection period and collected data was used only for the research purpose.

The main study was conducted for a period of 4weeks. The collected data was analyzed by using SPSS version 13.

Main findings of the study revealed that

- Descriptive and inferential statistics were used to analyze the collected data. Interpretation and discussion were based on the objectives, null hypotheses, conceptual framework and from various literature review.
- The pre test mean score of thermal stability at 10minutes before swaddle bath in group A were temperature 36.33 heart rate 142.00 respiratory rate 43 and oxygen saturation 92.13.
- The post test mean score of thermal stability at 10 minutes after swaddle bath in group A were temperature 35.36 heart rate 140.76 respiratory rate 45.93 and oxygen saturation 91.33
- The post test of thermal stability at 30minutes after swaddle bath in group A were temperature 36.11 heart rate 132.83 respiratory rate 42.53 and oxygen saturation 91.60.
- The post test mean score of crying duration in group A (swaddle bath) was 30 seconds (10%) to 2 minutes (40%)
- The pre test mean score of thermal stability at 10 minutes before conventional bath in group B were temperature 36.46 heart rate 140.00 respiratory rate 45.00 and oxygen saturation 92.30.
- The post test mean score of level of thermal stability at 10minutes after conventional bath in group B were temperature 34.50 heart rate 177.00 respiratory rate 65.33 and oxygen saturation 90.50.
- The post test mean score of thermal stability at 30 minutes after conventional bath in group B were temperature 35.21 heart rate 166.300 respiratory rate 57.53 and oxygen saturation 91.06.
- The post test mean score of crying duration in group B was 2 minutes (40%) to 3minutes 30 seconds (70%)
- The pre test analysis of thermal stability among preterm infants between the group A and group B revealed that the mean difference of temperature was -0.12 with ‘t’ value -0.78 and p value 0.43 ; mean difference of heart rate was 1.30 with ‘t’ value 0.47 and p value 0.63; mean difference of respiratory rate was -1.40 with ‘t’ value -0.94 and p value 0.34 and mean difference of oxygen saturation was -0.16 with ‘t’ value -0.40 and p value 0.68 which shows all the parameters in pre test was found statistically not significant between both the groups.

- The pos test analysis of thermal stability at 10minutes after bath among preterm infants between the group A and group B revealed that the mean difference of temperature was 0.86 with 't' value 2.27 and p value 0.02 ; mean difference of heart rate was -36.23 with 't' value -7.39 and p value 0.000; mean difference of respiratory rate was -19.40 with 't' value -10.75 and p value 0.000 and mean difference of oxygen saturation was 0.83 with 't' value 2.40 and p value 0.019 which shows all the parameters in post test was found statistically highly significant between both the groups.
- The pos test analysis of thermal stability at 30minutes after bath among preterm infants between the group A and group B revealed that the mean difference of temperature was 0.90 with 't' value 4.33 and p value 0.000 ; mean difference of heart rate was -33.46 with 't' value -6.80 and p value 0.000; mean difference of respiratory rate was -1.40 with 't' value -0.944 and p value 0.349 and mean difference of oxygen saturation was 0.53 with 't' value 1.39 and p value 0.16 which shows all the parameters in post test was found statistically highly significant except oxygen saturation between both the groups
- The correlation between post test level of thermal stability and post test crying duration among preterm infants in group A revealed that calculated 'r' value -0.698 indicated that there was negative correlation between temperature and crying duration which was found to be statistically significant at $p<0.01$ level; The calculated 'r' value -0.447 indicated that there was negative correlation between heart rate and crying duration which was found to be statistically significant at 10minutes after bath at $p<0.05$level and 'r' value -0.218 at 30minutes after bath statistically significant at $p<0.01$ level. The calculated 'r' value 0.155 indicated that there was positive correlation between respiratory rate and crying duration at 10minutes which was not statistically significant and the calculated 'r' value -0.195 indicated negative correlation at 30minutes after bath which was found statistically significant at $p<0.01$level. The calculated 'r' value 0.243 indicated there was positive correlation between oxygen saturation and crying duration at 10minutes after bath which was not statistically significant and the calculated 'r' value -0.086 indicated negative correlation at 30minutes after bath which was found to be statistically significant at $p<0.01$ level.

- The correlation between post test level of thermal stability and post test crying duration among preterm infants in group B revealed that calculated ‘r’ value -0.177 indicated that there was a negative correlation between temperature and crying duration at 10minutes after bath which was not statistically significant and the calculated ‘r’ value -0.406 indicated negative correlation at 30minutes after bath which was found to be statistically significant at $p<0.01$ level. The calculated ‘r’ value 0.101 indicated that there was positive correlation between heart rate and crying duration at 10minutes after bath which was not statistically significant and the calculated ‘r’ value 0.101 indicated that there was positive correlation at 30minutes after bath which was found to be statistically significant at $p<0.01$level. The calculated ‘r’ value -0.129 indicated there was negative correlation between respiratory rate and crying duration at 10minutes which was not statistically significant and the calculated ‘r’ value -0.129 indicated there was negative correlation at 30minutes after bath which was found to be statistically significant at $p<0.01$ level. The calculated ‘r’ value 0.022 indicated that there was positive correlation between oxygen saturation and crying duration which was not statistically significant and the calculated ‘r’ value 0.068 indicated there was positive correlation at 30minutes after bath which was found to be statistically high significant at $p<0.01$ level.
- The association of the mean score of thermal stability and their selected demographic variables in group A describes that mode of delivery, post natal age, gender, birth weight and type of feeding had significant association with temperature; type of feeding with respiratory rate. The association of mean scores of crying duration and their selected demographic variables describes that post natal age, gender, type of feeding and time of last feed before bath had significant association with crying duration in group A (swaddle bath).
- The association of the mean score of thermal stability and their selected demographic variables in group B describes that mode of delivery and time of last feed had significant association with temperature; gestational age and mode of delivery with heart rate; postnatal age and frequency of feeds with respiratory rate among preterm infants in group B. The association of mean scores of crying duration and their selected demographic variables describes that place of preterm

infant before bath had significant association with crying duration among preterm infants in group B.

6.2 CONCLUSION

The present study assessed the relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants. The findings proved that the swaddle bath was effective in maintaining the thermal stability after bath for shorter and prolonged period of time and reduced stress during the bath by reducing crying duration. Whereas in the conventional bath thermal stability was not maintained and could not reduce the distress i.e., the crying duration. Therefore the swaddle bath was found relatively effective than conventional bath in maintaining thermal stability and reducing crying duration and hence this bathing method, which includes in itself the principle components of developmental care, offers an appropriate, low stress and safe method for preterm infants and can be used as a routine bathing method in NICU's.

6.3 IMPLICATIONS

The investigator has drawn the following implications from the study which is a vital concern for nursing practice, nursing education, nursing administration and nursing research**.**

6.3.1 Nursing Practice

1. The pediatric nurse has a great opportunity and plays a major role in maintaining the thermal stability and reducing the crying duration among preterm infants through swaddle bath as an independent nursing intervention.
2. The pediatric care provider can formulate a separate protocol for swaddle bath which can be practiced on preterm infants in NICU's, preterm wards, mother-baby units as their daily routine practice.
3. The pediatric nurse should disseminate the information about swaddle bath to caregiver of preterm infants and thus can train their mothers as a part of preterm care to maintain thermal stability and reduce crying duration at home settings.

6.3.2 Nursing Education

1. The pediatric nurse as a nurse educator can incorporate the major study findings in the nursing curriculum at various levels to develop and well equip the staff nurses in the NICUs in order to identify and improve the prematurity level of preterm infants.
2. The nurse educator must enable the student nurses to gain skill required to perform swaddle bath to maintain the level of thermal stability and reduce crying duration.
3. The educational institution must provide opportunities for nursing students to get exposed to such training programs.

6.3.3 Nursing Administration

1. The pediatric nurse administrator along with the governing bodies and other health care agencies can formulate a program to focus on the measures to maintain the level of thermal stability and reduce crying duration of preterm infants.
2. This study can be utilized as policy to train the nursing students.
3. The nurse administrator within the institution should make the staff to carry out periodical surveillance and present an updated incidence on level of thermal stability and crying duration among preterm infants.
4. The nurse administrator should take initiation in organizing CNE, conferences and workshop on various trends of swaddle bath on level of thermal stability and crying duration among preterm infants.
5. The nurse administrator can allot separate budget for in-service education to disseminate the research findings to all nurses.
6. The nurse administrator can plan incentives or sponsorship for nurses undergoing swaddle bath training.

6.3.4 Nursing Research

1. The findings of the study can be disseminated to the staff nurses and student nurses working in various NICUs, preterm wards and mother-baby units through various media.
2. The generalization of the study results can be made further replicated in various settings and larger population.

3. Extensive research can be done on the other parameters that can have effect due to swaddle bath.

6.4 RESEARCH DISSEMINATION

1. Pilot study findings will be presented in upcoming National conference.
2. Research findings of the main study were presented in the 4th International Conference at Omayal Achi College of Nursing.
3. Research results will be published in Online Journal of ICCR, www.iccrjnr.com.
4. Research findings will be communicated through posters and newspaper articles.

6.5 UTILIZATION OF RESEARCH FINDING

1. The research was successfully implemented in Anand Hospital, Surat. A protocol on swaddle bath will be created and framed for NICU, Anand Hospital and which will be promoted by ICCR, Omayal Achi College of Nursing.
2. A protocol on swaddle bath will be framed and utilized in various other NICU's and preterm wards in various hospitals affiliated to Omayal Achi College of Nursing and pamphlets will be issued to the staff nurses and the care takers at the time of discharge as reinforcement
3. Swaddle bath procedure will be implemented as routine nursing care at various NICU's and preterm care units of various branches of Anand hospital in Surat.

6.6 RECOMMENDATIONS

The researcher gives a strong recommendation to the nurses to involve actively in teaching swaddle bath procedure to maintain thermal stability and reduce crying duration among preterm infants which helps to prevent various other neonatal complications.

The study recommends the following for further research

1. The researcher will recommend the staff nurses to give swaddle bath for preterm infants in Anand Hospital, Surat.
2. The researcher will recommend implementing swaddle bath in the practice area by the students of Omayal Achi College of Nursing and its affiliated hospitals.
3. The study can be replicated in the same setting for reinforcement.
4. A study can be replicated with large samples of preterm infants in the same setting for reinforcement.
5. A study can be conducted to assess the infection rates with the same population.

6. A study can be conducted to assess the other aspects of behavioural distress among preterm and term infants.
7. A study can be conducted to assess the effectiveness of swaddle bath on other parameters of preterm infants such as behavioural responses, feeding progression, sleep pattern, sucking efficiency and weight gain as well as the effect of this bathing method on mother-infant attachment, parental stress, confidence in parental skills and parent contentment.

6.7 LIMITATIONS

1. The investigator found it very hard to get a setting to conduct study
2. The investigator found it very difficult to get the related reviews of literature.

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APPENDICES

APPENDIX – C

LETTER SEEKING EXPERT'S OPINION FOR CONTENT VALIDITY

From

Ms.Gaddam Swapna

M.sc (N) 2014-2016 Batch,

Omayal Achi College of Nursing,

Puzhal, Chennai.

To

Respected Sir/Madam,

Subject: Requisition for expert opinion for content validity.

I am Ms. Gaddam Swapna, M.sc Nursing student specializing in Child Health Nursing at Omayal Achi College of Nursing under the guidance of Dr.Mrs.S.Kanchana, Research Director ICCR and Speciality Guide Ms.P.Nandhini. As a part of my research project to be submitted to the Tamil Nadu Dr. M.G.R. Medical University February 2016 and in partial fulfillment of the University requirement for the award of M.Sc (N) degree, I am conducting **"A true experimental study to assess the relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants at selected Hospital, Surat".** I have enclosed my data collection and intervention tool for your expert guidance and validation. Kindly do the needful.

Thanking you,

Yours faithfully,

(Ms.Gaddam Swapna)

ENCLOSURES:

1. Research proposal
2. Data collection tool
3. Intervention tool
4. Content validity form
5. Certificate for content validity

LIST OF EXPERTS FOR CONTENT VALIDITY

CHILD HEALTH MEDICAL EXPERTS

1. **Dr. Aravind, M.D.,DCH**
   Head of the department,
   Pediatric & Neonatal Intensive Care Unit,
   Raja Sir Ramaswamy Mudaliar Hospital,
   Royapuram, Chennai – 600013.

2. **Dr. Chetan.B.Shah, MD., DCH.,**
   Pediatrician & Neonatologist,
   Anand Hospital,
   Surat, Gujarat-300656

CHILD HEALTH NURSING EXPERTS

1. **Mrs. Nesa Sathya Satchi, M.Sc.(N).,**
   Head of the Department,
   Child Health Nursing,
   Apollo College of Nursing,
   Vanagaram, Chennai – 600 095.

2. **Mr. Siva Subramanyam, M.Sc.(N),**
   Principal,
   Kalptaru College of Nursing,
   Udayapur, Rajasthan – 313002.

APPENDIX – D

NO HARM CERTIFICATE FOR INTERVENTION

Name of the investigator : Ms. Gaddam Swapna

Name of the intervention : Group A - Swaddle bath

Group B - Conventional bath.

Aim of the study: To maintain the thermal stability and reduce crying duration among preterm infants

Purposes of bath:

- ✓ To maintain personal hygiene of the preterm infant
- ✓ To prevent microbial colonization and nosocomial infection
- ✓ To rehydrate skin surface and preserve skin integrity
- ✓ To stimulate and improve circulation within the body
- ✓ To reduce behavioural distress by reducing crying duration.

Indications of bath:

5. Preterm infants with stable physiological parameters (Temperature >35^0c & <37.5^0c, Heart rate 120-170beats/min, Respiratory rate 40-70breaths/min and Oxygen saturation 90-94%) based on their gestational age and after the umbilical cord fall.

- ✓ Preterm infants born between 30-36weeks of gestation
- ✓ Preterm infants weighing >/= 1500gm

Contraindications of bath:

- ✓ Preterm infants with unstable physiological parameters
- ✓ Preterm infants born before 30weeks of gestation
- ✓ Preterm infants with congenital anomalies
- ✓ Preterm infants who are severely ill

Group-A: Swaddle Bath

Time : 5minutes

Method : one -to -one

Venue : Procedure room

Preliminary Preparation

- **Pre-Procedure:** After gaining informed written consent from the parents regarding intervention, its time and duration, the investigator explains the intervention to the parents that intervention will be given to preterm infants in the morning between 5am -11am

Preparation of articles:

Articles	Number	Rationale
• A clean tray containing :		
Digital thermometer	1	To check temperature before and after bath
Stethoscope	1	To check heart rate before and after bath
Portable pulse oximeter	1	To check Oxygen Saturation before and after bath
Bath thermometer	1	To check water temperature before bath
Kidney tray	1	To receive the waste
Autoclaved Swaddle cloth	2	To wrap the baby before and after bath
Towel	1	To dry the preterm infant
Cotton balls in a container	2	To clean the eyes during bath
Mild foamless soap	1	To remove dirt from body
Diaper	1	To collect urine and stool
• Bath tub	1	To bath the baby

Preparation of environment: The investigator arranges all the necessary articles and puts off the fan, maintaining the room to atmospheric temperature.

Preparation of the investigator: The investigator arranges all the necessary articles at bedside and wear cap, mask and performs hand hygiene.

Preparation of preterm infant: The investigator checks the physiological parameters 10minutes before bath and then checks whether the baby is wet with urine or stool. If wet, cleanses the baby at the bedside and checks weight before bath, swaddles the baby with autoclaved thick soft towel in which preterm infants hands brought to face, hands and legs in flexed midline position and performs eye care from inner canthus to outer canthus by one stroke using separate swabs for each eye and washes face .

- **During Procedure**: The investigator places preterm infant in tub of warm water of temperature 100°-101° F immersing till shoulders supporting infant's shoulders and

head at all times. The investigator gives bath with mild foamless soap and water, initiates as unswaddles, washes and reswaddles the left leg then unswaddles, washes and reswaddles the other leg one at a time and then unswaddles, washes and reswaddles both the hands one at a time. Then washes the infant's neck, trunk, abdomen, genital area and back. Reswaddles the infant again and finally washes the head. The investigator unswaddles the infant and takes off infant from the tub. The whole procedure will be recorded using video camera with the help of research assistant.

S.No.	Steps	Duration (Minutes)
1.	Unswaddles, washes and reswaddles both the legs one at a time.	1
2.	Unswaddles, washes and reswaddles both the hands one at a time.	1
3.	Washes the infant's neck, trunk, abdomen and genital area	1
4.	Washes the infants back by reswaddling trunk	1
5.	Washes the head by reswaddling the body	1
	Total	**5**

- **Post Procedure (After care):** The investigator dries the baby completely and puts on diaper, mummifies and gives to mother for feeding. The investigator checks temperature at the 10^{th} and 30^{th} minute after the bath procedure and replaces the articles. Preterm infants are then allowed to perform their routine activities.

Group-B: Conventional Bath

Time : 5mins

Method : one -to -one

Venue : Procedure room

Preliminary preparation

- **Pre Procedure:** After gaining informed written consent from the parents regarding intervention, its time and duration, the investigator explains the intervention to the parents that intervention will be given to preterm infants in the morning between 5am -11am.

Preparation of articles:

Articles	Number	Rationale
A Clean tray containing:		
Digital thermometer	1	To check temperature before and after bath
Portable pulse oximeter	1	To check heart rate before and after bath
Stethoscope	1	To check Oxygen Saturation before and after bath
Wet wipes	4	To bath the baby for wiping body
Towel	2	1 to receive the preterm infant before bath 1 to mummify the preterm infant after bath
Cotton balls in a container	2	To wipe the eyes of preterm infant during bath
Kidney tray	1	To receive the waste
Diaper	1	To collect the stool and urine

Preparation of environment: The investigator arranges all the necessary articles and puts off the fan, maintaining the room to atmospheric temperature.

Preparation of preterm infant: The investigator checks the physiological parameters 10minutes before bath and then checks whether the baby is wet with urine or stool. If wet, cleanses the baby at the bedside and checks weight before bath after which wipes the infant's eyes from inner canthus to outer canthus using separate swabs for each eye in one stroke .

Preparation of the investigator: The investigator arranges all the necessary articles at bedside and wear cap mask and performs hand hygiene.

- **During Procedure :** The investigator receives preterm infant and gives bath using wet wipes starting from the infant's face and neck to hands ,trunk, abdomen, genitals, lower limbs and back using wet wipes and mummify the infant and end the bath. The whole procedure will be recorded using video camera with the help of research assistant.

S.No.	Steps	Duration(Minutes)
1.	Wipes the infant's face and neck using wet wipe	1
2.	Wipes both the hands of the infant using wet wipe	1
3.	Wipes the infant's neck, trunk, abdomen and genital area using wet wipe	1
4.	Wipes the infants back using wet wipe	1
5.	Wipes both the legs one at a time using wet wipes	1
	Total	**5**

- **Post Procedure (After care):** The investigator dries the baby completely and puts on diaper, mummifies and gives to mother for feeding. The investigator checks temperature at the 10^{th} and 30^{th} min after the bath procedure and replaces the articles. Preterm infants are then allowed to perform their routine activities.

When to stop: If the preterm infant shows any signs of irritability and distress the procedure must be stopped.

Preterm infants in NICU will be given the safe, secure and familiar uterine environment simulating by swaddle bath to group A and simple, easy and time saving to nurses by conventional bath to group B. Nursing interventions were compared in order to provide best bath for preterm infants to maintain thermal stability and reduce crying duration. The above mentioned interventions are daily nursing procedures and will not harm the preterm infants.

Signature with date :

Seal :

APPENDIX – E

CERTIFICATE FOR ENGLISH EDITING

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Ms.Gaddam Swapna, M.Sc nursing 2014-2016 Batch student Omayal Achi College of nursing Chennai, conducted a dissertation work on **"A true experimental study to assess the relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants at selected Hospital, Surat,2015"** under the guidance of Ms.Nandhini.P, Assistant professor as a partial fulfillment of The Tamil Nadu Dr. M.G.R Medical University requirement for the award of M.Sc Nursing degree is edited for English language appropriateness by

_____

Seal: Signature with Date

CERTIFICATE FOR GUJARATHI EDITING

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Ms.Gaddam Swapna, M.Sc nursing 2014-2016 Batch student Omayal Achi College of nursing Chennai, conducted a dissertation work on **"A true experimental study to assess the relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants at selected Hospital, Surat,2015"** under the guidance of Ms.Nandhini.P, Assistant professor as a partial fulfillment of The Tamil Nadu Dr. M.G.R Medical University requirement for the award of M.Sc Nursing degree is edited for Gujarathi language appropriateness by_____

Seal: Signature with Date

APPENDIX – F

INFORMED CONSENT REQUISITION FORM

From,
Gaddam Swapna,
M.Sc Nursing IIyr,
Omayal Achi College of Nursing,
Puzhal, Chennai- 600066.

To
The Care giver/ Mother.
Id. No._____
Neonatal Intensive Care Unit,
Anand Children Hospital,
Surat.

Good morning,

I Ms.Gaddam Swapna, M.sc Nursing student from Omayal Achi College of Nursing, Chennai, conducting a true experimental study to assess the relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants at selected hospital, Surat, as a partial fulfilment of the requirement for the degree of M.Sc. Nursing under The Tamil Nadu Dr. M.G.R. Medical University.

I assure you that information provided by you will be kept confidential. So, I request you to kindly cooperate with me and participate in this study by giving your frank and honest responses to the questions being asked.

Thank you.

Signature of the investigator

Gaddam Swapna.

જાણકાર સંમતિ માંગ-પત્રક

સવારે ગુડ,

હું Ms.Gaddam.Swapna, M.sc (નર્સિંગ હોમ) નર્સિંગ Omayal Achi કોલેજ વિદ્યાર્થી, ચેન્નાઇ, સાચી પ્રાયોગિક અભ્યાસ કરવા અધૂરા મહિને પ્રસૂતિ વચ્ચે swaddle સ્નાન અને થર્મલ સ્થિરતા સ્તર પર પરંપરાગત સ્નાન સંબંધિત અસરકારકતા અને ધ્યાનાકર્ષક સમયગાળો આકારણી કરવા માટે M.Sc. ની ડિગ્રી માટે જરૂરિયાત અંશતઃ પરિપૂર્ણતા તરીકે પસંદ હોસ્પિટલ, ચેન્નાઇ ખાતે શિશુ તમિળનાડુ ડૉ M.G.R. હેઠળ નર્સિંગ મેડિકલ યુનિવર્સિટી.

હું તમને તમારા દ્વારા પૂરી પાડવામાં તે માહિતી ગુપ્ત રાખવામાં આવશે ખાતરી આપવી. તેથી, હું તમને માયાળુ મારી સાથે સહકાર અને પ્રશ્નો પૂછવામાં આવે છે તમારી નિખાલસ અને પ્રમાણિક જવાબો આપીને આ અભ્યાસમાં ભાગ વિનંતી છે.

આભાર

તપાસનીસ ની સહી

Gaddam.Swapna

INFORMED WRITTEN CONSENT FORM

I father or mother of _____ aged _____ understand that my child (younger than 18 years of age) being asked to participate in a research study conducted by Ms. Gaddam Swapna, M.sc nursing student of Omayal Achi College of Nursing, Puzhal. This research study will evaluate **"Relative effectiveness of swaddle bath and conventional bath on level of thermal stability and crying duration among preterm infants at selected hospital, Surat.** If I agree to participate my child in the study, I will be given structured questionnaire to know the demographic variable and my child will be observed for level of thermal stability and crying duration by using the W.H.O guidelines and Video recording for crying duration respectively. The answers and the videos will be kept confidential. No identifying information will be included during the analysis process. I understand that there are no risks associated with this study.

I realize that the knowledge gained from this study may help either my child or other child in the future. I realize that my child's participation in this study is entirely voluntary and I may withdraw my child from the study at any time I wish. If I decide to discontinue my child's participation in this study, my child will be continued to be treated in the usual and customary fashion.

I understand that all study will be kept confidential. However, this information may be used in nursing publication or presentations. If I need to, I can contact Ms.Gaddam Swapna, M.sc Nursing 2014-2016 Batch student Omayal Achi College of Nursing, Puzhal phone no: 044-26501617 at any time during the study. The study has been explained to me. I have read and understood the consent form, my entire question has been answered, and I agree to participate my child in the study. I understand that I will be given a copy of this signed consent form.

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Thumb print/Signature of parent / Guardian Date:

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Signature of investigator Date:

જાણ લેખિત સંમતિ ફોર્મ

હું પિતા કે માતા _____ વૃદ્ધ _____ મારા બાળકને (વય કરતાં નાના 18 વર્ષ) કુ Gaddam.Swapna, નર્સિંગ Puzhal ના Omayal Achi કોલેજ ઓફ M.sc નર્સિંગ વિદ્યાર્થી દ્વારા હાથ ધરવામાં આવેલા એક સંશોધન અભ્યાસ માં ભાગ પૂછવામાં આવે છે કે સમજે છે. આ સંશોધન અભ્યાસ પસંદ હોસ્પિટલ ખાતે અકાળ નવજાત વચ્ચે "swaddle સ્નાન અને થર્મલ સ્થિરતા સ્તર પર પરંપરાગત સ્નાન સંબંધિત અસરકારકતા અને ધ્યાનાકર્ષક સમયગાળો મૂલ્યાંકન કરશે,Chennaiહું અભ્યાસ મારા બાળકને ભાગ સંમત હોય તો, હું વસ્તી વિષયક ચલ ખબર માટે રચાયેલ પ્રશ્નાવલી આપવામાં આવશે અને મારા બાળકને W.H.O માર્ગદર્શિકા ઉપયોગ કરીને થર્મલ સ્થિરતા અને ધ્યાનાકર્ષક સમયગાળો સ્તર માટે નિરીક્ષણ કરવામાં આવશે. જવાબો ગુપ્ત રાખવામાં આવશે. કોઈ ઓળખવા માહિતી વિશ્લેષણ પ્રક્રિયા દરમ્યાન સમાવવામાં આવશે. હું આ અભ્યાસ સાથે સંકળાયેલ કોઈ જોખમ રહેલું હોય છે કે જે સમજવા.

હું આ અભ્યાસ પરથી મેળવવામાં આવેલું જ્ઞાન ભવિષ્યમાં મારા બાળકને અથવા અન્ય બાળક ક્યાં મદદ કરી શકે છે કે જે ખ્યાલ. હું આ અભ્યાસમાં મારા બાળકના ભાગીદારી સંપૂર્ણપણે સ્વૈચ્છિક છે ખ્યાલ છે કે અને હું માંગો કોઈપણ સમયે અભ્યાસ પરથી મારા બાળકને પાછું ખેંચી શકે છે. હું આ અભ્યાસમાં મારા બાળકના ભાગીદારી બંધ કરવાનું નક્કી કર્યું હોય, મારા બાળક સામાન્ય અને રૂઢિગત ફેશન સારવાર કરી ચાલુ રહેશે.

હું બધા અભ્યાસ ગુપ્ત રાખવામાં આવશે કે સમજે છે. જો કે, આ માહિતી નર્સિંગ પ્રકાશન અથવા પ્રસ્તુતિઓ ઉપયોગ કરી શકે છે. અભ્યાસ દરમિયાન કોઈ પણ સમયે 044-26501617: હું જરૂર હોય તો, હું Ms.Gaddam.Swapna, M.sc નર્સિંગ 1 લી વર્ષે Omayal Achi કોલેજ કોઈ નર્સિંગ Puzhal ફોન સંપર્ક કરી શકો છો. આ અભ્યાસમાં મને સમજાવી છે. હું વાંચી અને સંમતિ ફોર્મ સમજી, મારા સમગ્ર પ્રશ્ન જવાબ અપાઈ છે અને હું અભ્યાસ મારા બાળકને ભાગ સંમત છે. હું આ સંમતિ ફોર્મ પર સહી કરી એક નકલ આપવામાં આવશે કે સમજી.

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પિતૃ અંગૂઠા પ્રિન્ટ / હસ્તાક્ષર તારીખ:

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તપાસનીશ હસ્તાક્ષર તારીખ:

APPENDIX – G

RESEARCH TOOL

SECTION-A: DEMOGRAPHIC DATA

Instructions: Choose appropriate option

1. Gestational age in weeks

    A) 30

    B) 31

    C) 32

    D) 33

    E) 34

    F) 35

    G) 36

2. Mode of delivery

    A) Normal vaginal delivery

    B) Caesarean section

    C) Others

3. Postnatal age

    A) 1wk (7days)

    B) 2wk (8-14)

    C) 3wk (15-21)

    D) 4wk (22-30)

4. APGAR Score at 5^{th} minute of birth

    A) <5

    B) 5-7

    C) >7

5. Gender

    A) Male

    B) Female

6. Birth weight of preterm infant in grams

A) 1500-1700

B) 1701-1900

C) 1901-2100

D) 2101-2300

E) 2301-2500

F) >2500

G) <1500

7. Weight of preterm infant before bath in grams

A) 1500-1700

B) 1701-1900

C) 1901-2100

D) 2101-2300

E) 2301-2500

F) >2500

8. Type of feed

A) Expressed Breast feed

B) Formula feed

C) Combination (A)+(B)

9. Frequency of feeds in a day

A) Every 1 hourly

B) Every 2 hourly

C) Every 3 hourly

D) On demand

10. Time of last feed before bath

A) 1hour

B) 2hour

C) 3hour

D) 4hour

11. Place of preterm before bath

A) Open Cot

B) Radiant warmer

C) Others

SECTION- B: ASSESSMENT OF THERMAL STABILITY

Parameters	Inference	Range
Temperature(^{0}c)	Hyperthermia	>37.5
	Normal	36.5-37.5
	Mild hypothermia	36.4-35.2
	Moderate hypothermia	32-35.1
	Severe hypothermia	<32
Heart Rate(beats/min)	Tachycardia	>170
	Normal	120-170
	Bradycardia	<120
Respiratory rate (breaths/min)	Tachypnoea	>70
	Normal	40-70
	Bradypnoea	<40
Oxygen saturation (%)	Normal	92-94
	Mild desaturation	90-91
	Moderate desaturation	88-89
	severe desaturation	<88

Source: "Thermal control of the Preterm's, a practical guide. WHO

SECTION- C: ASSESSMENT OF CRYING DURATION

To record the crying duration, the preterm infants faces can be filmed in close-up from the beginning till the end of the bath using digital camera, crying duration can be obtained by calculating crying percentage using formula,

$$\text{Crying percentage} = \frac{\text{Crying duration}}{\text{Total bath time (minutes)}} \times 100$$

Crying Duration is Assessed & Interpreted By:

- A computer with media player software can be applied for viewing each recording session of crying during bath.

INDICATOR	VALUE	GROUP-A (INTERVENTION: SWADDLE BATH)																														
Thermal stability		1			2			3			4			5			6			7			8			9			1		
Temperature (°c)		O1	O2	O3	O1	O2	O3	O1	O2	O3	O1	O2	O3	O1	O2	O3	O1	O2	O3	O1	O2	O3	O1	O2	O3	O1	O2	O3	O1	O	
	<32																														
	32.1-35.1																														
	35.2-36.4																														
	36.5-37.5																														
	>37.5																														
Heart Rate (Beats/Min)	<120																														
	120-170																														
	>170																														
Respiratory Rate (Breaths/Min)	<40																														
	40-70																														
	>70																														
Oxygen Saturation(%)	<88																														
	88-89																														
	90-91																														
	92-94																														
Crying Duration (Minutes)	DURING BATH (D)																														

KEY: O1 – 10th Minute Before Bath, O2 – 10th Minute After Bath, O3 – 30th Minute after Bath

INDICATOR	VALUE	GROUP-B (INTERVENTION: CONVENTIONAL BATH)																														
Thermal stability		1			2			3			4			5			6			7			8			9			1		
Temperature (°c)		O1	O2	O3	O1	O2	O3	O1	O2	O3	O1	O2	O3	O1	O2	O3	O1	O2	O3	O1	O2	O3	O1	O2	O3	O1	O2	O3	O1	O2	O3	C
	<32																															
	32.1-35.1																															
	35.2-36.4																															
	36.5-37.5																															
	>37.5																															
Heart Rate (Beats/Min)	<120																															
	120-170																															
	>170																															
Respiratory Rate (Breaths/Min)	<40																															
	40-70																															
	>70																															
Oxygen Saturation(%)	<88																															
	88-89																															
	90-91																															
	92-94																															
Crying Duration (Minutes)	DURING BATH (D)																															

KEY: O1 – 10th Minute Before Bath, O2 – 10th Minute After Bath, O3 – 30th Minute after Bath

APPENDIX – H

CODING FOR THE DEMOGRAPHIC VARIABLES

Demographic Data	Code No.
1. Gestational age in weeks	
A) 30	1
B) 31	2
C) 32	3
D) 33	4
E) 34	5
F) 35	6
G) 36	7
2. Mode of delivery	
A) Normal vaginal delivery	1
B) Caesarean section	2
C) Others	3
3. Postnatal age	
A) 1wk (7days)	1
B) 2wk (8-14days)	2
C) 3wk (15-21days)	3
D) 4wk (22-30days)	4
4. APGAR Score at 5^{th} minute of birth	
A) <5	1
B) 5-7	2
C) >7	3
5. Gender	
A) Male	1
B) Female	2
6. Birth weight of preterm infant in grams	
A) 1500-1700	1
B) 1701-1900	2

C) 1901-2100 3

D) 2101-2300 4

E) 2301-2500 5

F) >2500 6

G) <1500 7

7. Weight of preterm infant before bath in grams

A) 1500-1700 1

B) 1701-1900 2

C) 1901-2100 3

D) 2101-2300 4

E) 2301-2500 5

F) >2500 6

8. Type of feed

A) Expressed Breast feed 1

B) Formula feed 2

C) Combination (A)+(B) 3

9. Frequency of feeds in a day

A) Every 1 hourly 1

B) Every 2 hourly 2

C) Every 3 hourly 3

D) On demand 4

10. Time of last feed before bath

A) 1hour 1

B) 2hour 2

C) 3hour 3

D) 4hour 4

11. Place of preterm before bath

A) Open Cot 1

B) Radiant warmer 2

C) Others 3

APPENDIX – I

BLUE PRINT OF DATA COLLECTION TOOL

S.NO.	CONTENT	ITEM	TOTAL ITEM	PERCENTAGE
1.	**Demographic variables**	1 – 11	11	
2.	**Physiological indicator:**			
	• Temperature	1 – 5	5	31.25
	• Heart rate	1 – 3	3	18.75
	• Respiratory rate	1 – 3	3	18.75
	• Oxygen saturation	1 – 4	4	25.00
3.	**Behavioural indicator:**			
	• Crying duration	1	1	6.25
Total		**16**	**16**	**100%**

APPENDIX – J

INTERVENTION TOOL

Group-A: Swaddle Bath

Time : 5minutes

Method : one -to -one

Venue : Procedure room

Pre-Procedure: After gaining informed written consent from the parents regarding intervention, its time and duration, the investigator explains the intervention to the parents that intervention will be given to preterm infants in the morning between 5am -11am

Preparation of articles:

Articles	Number	Rationale
• A clean tray containing :		
Digital thermometer	1	To check temperature before and after bath
Stethoscope	1	To check heart rate before and after bath
Portable pulse oximeter	1	To check Oxygen Saturation before and after bath
Bath thermometer	1	To check water temperature before bath
Kidney tray	1	To receive the waste
Swaddle cloth	2	To wrap the baby before and after bath
Towel	2	One to receive the preterm infant before bath One to mummify the preterm infant after bath
Cotton balls in a container	2	To clean the eyes during bath
Mild foamless soap	1	To remove dirt from body
Diaper	1	To defecate and urinate
• Bath tub	1	To bath the baby

Preparation of environment: The investigator arranges all the necessary articles and puts off the fan, maintaining the room to atmospheric temperature.

Preparation of preterm infant: The investigator checks the physiological parameters 10minutes before bath and then checks whether the baby is wet with urine or stool. If wet, cleanses the baby at the bedside and checks weight before bath, swaddles the baby with autoclaved thick soft towel in which preterm infants hands brought to face, hands and legs in flexed midline position and performs eye care from inner canthus to outer canthus by one stroke using separate swabs for each eye washes face.

Preparation of the investigator: The investigator arranges all the necessary articles at bedside and wear cap,mask and performs hand hygiene.

During Procedure: The investigator places preterm infant in tub of warm water of temperature 100°-101° F immersing till shoulders supporting infant's shoulders and head at all times. The investigator gives bath with mild soap and water, initiates as unswaddles, washes and reswaddles the right leg then unswaddles, washes and reswaddles the other leg one at a time and then unswaddles, washes and reswaddles both the hands one at a time. Then washes the infant's neck, trunk, abdomen, genital area and back. Reswaddles the infant again and finally washes the head. The investigator unswaddles the infant and takes off infant from the tub. The whole procedure will be recorded using video camera with the help of research assistant.

S.No.	Steps	Duration (Minutes)
1.	Unswaddles, washes and reswaddles both the legs one at a time.	1
2.	Unswaddles, washes and reswaddles both the hands one at a time.	1
3.	Washes the infant's neck, trunk, abdomen and genital area	1
4.	Washes the infants back by reswaddling trunk	1
5.	Washes the head by reswaddling the body	1
	Total	**5**

Post Procedure: The investigator dries the baby completely and puts on diaper, mummifies and gives to mother for feeding. The investigator checks temperature at the 10^{th} and 30^{th} minute after the bath procedure. Preterm infants are then allowed to perform their routine activities.

Group-B: Conventional Bath

Time : 5mins

Method : one -to -one

Venue : Procedure room

Pre Procedure: After gaining informed written consent from the parents regarding intervention, its time and duration, the investigator explains the intervention to the parents that intervention will be given to preterm infants in the morning between 5am -11am.

Preparation of articles:

Articles	Number	Rationale
A Clean tray containing:		
Digital thermometer	1	To check temperature before and after bath
Portable pulse oximeter	1	To check heart rate before and after bath
Stethoscope	1	To check Oxygen Saturation before and after bath
Bath thermometer	1	To check water temperature before bath
Towel	2	One to receive the preterm infant before bath One to mummify the preterm infant after bath
Wet wipes	4	To bath the baby for wiping body
Cotton balls in a container	2	To wipe the eyes of preterm infant
Kidney tray	1	To receive the waste
Diaper	1	To defecate and urinate

Preparation of environment: The investigator arranges all the necessary articles and puts off the fan, maintaining the room to atmospheric temperature.

Preparation of preterm infant: The investigator checks the physiological parameters 10 minutes before bath and then checks whether the baby is wet with urine or stool. If wet, cleanses the baby at the bedside and checks weight before bath after which wipes the infant's eyes from inner canthus to outer canthus using separate swabs for each eye in one stroke .

Preparation of the investigator: The investigator arranges all the necessary articles at bedside and wear cap mask and performs hand hygiene.

During Procedure : The investigator receives preterm infant and gives bath using wet wipes starting from the infant's face and neck to hands ,trunk, abdomen, genitals, lower limbs and back using wet wipes and end the bath. The whole procedure will be recorded using video camera with the help of research assistant.

S.No.	Steps	Duration(Minutes)
1.	Wipes the infant's face and neck using wet wipe	1
2.	Wipes both the hands of the infant using wet wipe	1
3.	Wipes the infant's neck, trunk, abdomen and genital area using wet wipe	1
4.	Wipes the infants back using wet wipe	1
5.	Wipes both the legs one at a time using wet wipes	1
	Total	**5**

Post Procedure: The investigator dries the baby completely and puts on diaper, mummifies and gives to mother for feeding. The investigator checks temperature at the 10^{th} and 30^{th} min after the bath procedure. Preterm infants are then allowed to perform their routine activities.

APPENDIX – K

PROTOCOL ON SWADDLE BATH

Definition:

Swaddle bath is defined as bath in which the nurse must snuggly wrap the infant with autoclaved thick soft towel in a flexed midline position and place in the tub filled with warm water with the temperature of 100-101° Fahrenheit and immerse till shoulder level. Then unwrap each part of the body individually, wash with mild foamless soap, rinse from lower and upper limbs, trunk to head and rewrap again.

Purposes of bath:

- ✓ To maintain personal hygiene of the preterm and term infant
- ✓ To prevent microbial colonization and nosocomial infection
- ✓ To rehydrate skin surface and preserve skin integrity
- ✓ To stimulate improve circulation within the body
- ✓ To maintain thermal stability among preterm infants
- ✓ To reduce crying duration among preterm infants during bath

Indications of bath:

- ✓ Preterm and term infants with stable physiological parameters (Temperature $>35^0$c & $<37.5^0$c, Heart rate 120-170beats/min, Respiratory rate 40-70breaths/min and Oxygen saturation 90-94%) based on their gestational age and after the umbilical cord fall.
- ✓ Neonates born after 30weeks of gestation
- ✓ Preterm infants weighing ≥ 1500gms

Contraindications of bath:

- ✓ Preterm infants with unstable physiological parameters
- ✓ Preterm infants born before 30weeks of gestation
- ✓ Preterm infants with congenital anomalies
- ✓ Preterm infants who are severely ill

Preliminary assessment:

1. Check the physician's orders to note the specific considerations to be taken, if any.
2. Assess the infants need for bathing.
3. Check the vital signs and skin colour of the baby.
4. Ensure whether the baby was not fed within the previous 1hour.
5. Provide explanation to mother.
6. Check the articles available in the unit.

Preparation of articles:

Articles	Number	Rationale
• A clean tray containing :		
Bath thermometer	1	To check water temperature before bath
Kidney tray	1	To receive the waste
Autoclaved Swaddle cloth	2	To wrap the baby before and after bath
Towel	1	To dry the preterm infant
Cotton balls in a container	2	To clean the eyes during bath
Mild foamless soap	1	To remove dirt from body
Diaper	1	To collect urine and stool
• Bath tub	1	To bath the baby

Preparation of environment:

S.No	Steps	Rationale
1.	**Prepare bathing area:** ✓ Keep the table against wall ✓ Place the tub on one end and toilet tray and clothing on other end	**To prevent baby from falling**
2.	Close the windows and put off fan	To prevent draughts
3.	Assemble all the articles before beginning the procedure.	Avoids need of leaving the baby in the middle of bath

Preparation of the investigator: Wear cap, mask and perform hand hygiene to prevent infection.

Preparation of preterm infant: The nurse must check vital signs and then check whether the baby is wet with urine or stool.

If wet, clean the baby at the bedside and swaddle the baby with autoclaved thick soft towel in which preterm infants hands brought to face, hands and legs in flexed midline position and perform eye care from inner canthus to outer canthus by one stroke using separate swabs for each eye and washes face with plain water.

- **During Procedure**: Place the preterm or term infant in tub of warm water of temperature 100°-101° F, immerse till shoulders supporting infant's shoulders and head at all times. Give bath with mild foamless soap and water, initiate as unswaddle, wash and reswaddle the left leg then unswaddle, wash and reswaddle the other leg one at a time and then unswaddle, wash and reswaddle both the hands one at a time. Then wash the infant's neck, trunk, abdomen, genital area and back. Reswaddle the infant again and finally wash the head. Then unswaddle the infant and take infant from the tub.

S.No.	Steps	Rationale	Duration (Minutes)
1.	• Unswaddle, wash and reswaddle both the legs of the baby one at a time. 	• To prevent exposure to the outside environment which there by prevents heat loss from the body.	1
2.	• Unswaddle, wash and reswaddle both the hands of the baby one at a time. 	• To prevent exposure to the outside environment which there by prevents heat loss from the body	1
3.	• Washes the infant's neck, trunk, abdomen and genital area of the baby 	• To prevent exposure to the outside environment which there by prevents heat loss from the body	1

S.No.	Steps	Rationale	Duration (Minutes)
4.	• Washes the infants back and spine by reswaddling trunk of the baby. 	• To prevent exposure to the outside environment which there by prevents heat loss from the body.	1
5.	• Washes the head by reswaddling the body of the baby 	• To prevent exposure to the outside environment which there by prevents heat loss from the body	1
	Total		**5**

- **Post Procedure**

  After care of the baby and articles:

  1. The nurse must dry the baby completely by patting gently and dresses the baby, puts on diaper and mummify.
  2. Check vital signs after the bath procedure.
  3. Handover the baby to his/her mother for feeding.
  4. Take the articles to the utility room. Send the swaddle clothes for autoclaving and disinfect the towel and tub. Clean and dry them and replace them in proper place.
  5. Wash hands to prevent cross contamination
  6. Record the procedure in the nurse's record with date and time.

Special Considerations:

- ✓ Baby bath should be given prior to feeding or at least one hour after previous feeding.
- ✓ Bath must be given from trunk to head in order to prevent heat loss from head
- ✓ Bath to be given about the same time every day to form a regular schedule.
- ✓ Calm the baby before starting the bath by proper swaddling technique.
- ✓ Use gloves for the first bath for preventing contact with body fluids.
- ✓ The preterm infant's head and neck must be supported at all the times during the

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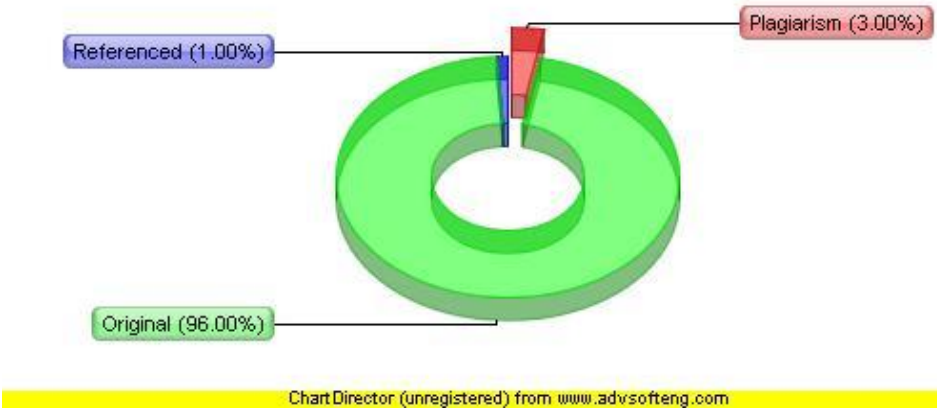

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APPENDIX – M

DISSERTATION EXECUTION PLAN - GANNT CHART																			
S.NO	**CALANDER MONTHS**	**Nov '14**	**Dec '14**	**Jan '15**	**Feb '15**	**Mar '15**	**Apr '15**	**May '15**	**June '15**	**July '15**	**Aug '15**	**Sep '15**	**Oct '15**	**Nov '15**	**Dec '15**	**Jan '16**	**Feb '16**	**Mar '16**	**Apr '16**
A	**Conceptual phase**																		
1	Problem identification																		
2	Literature review																		
3	Clinical fieldwork																		
4	Theoretical framework																		
5	Hypothesis formulation																		
B	**Design & planning phase**																		
6	Research design																		
7	Intervention protocol																		
8	Population specification																		
9	Sampling plan																		
10	Data collection plan																		
11	Ethics procedure																		
12	Finalization of plans																		
C	**Empirical phase**																		
13	Data collection																		
14	Data preparation																		
D	**Analytical phase**																		
15	Data analysis																		
16	Interpretation of results																		
E	**Dissemination phase**																		
17	Presentation or report																		
18	Utilization of findings																		
	Calendar months	**11**	**12**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	09	10	11	12	13	01	02	**03**

APPENDIX – N

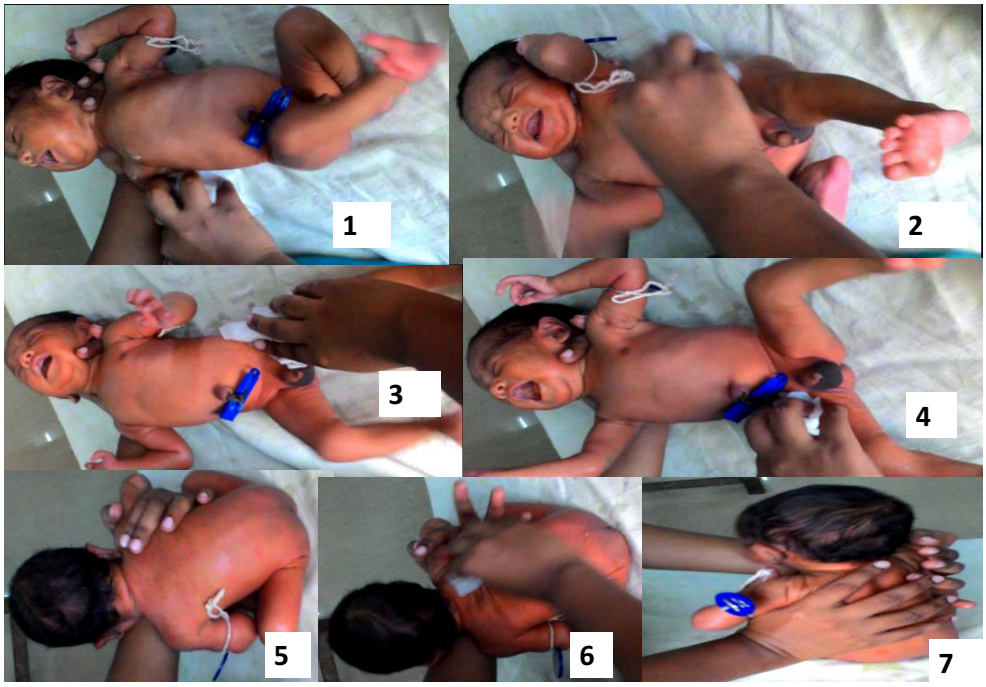
PHOTOGRAPHS

Pre procedure

Procedure

SWADDLE BATH

Oral Informed Consent was obtained to publish the photographs in the dissertation.



CONVENTIONAL BATH

Post procedure

Oral

Informed Consent was obtained to publish the photographs in the dissertation.

THANK

you.....ALL

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